FIRE CONTROL NOTEBOOK

#2175

CALIFORNIA REGION
U. S. FOREST SERVICE
1957

GPO 973087

R-5
MODEL 48
COMPUTER

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I. INTRODUCTION

The contents of this notebook provide a ready reference to fire suppression principles and data, the use of which should aid forest officers materially;

(1) In sizing up the job.
(2) In preparing a complete plan.
(3) In executing decisive action.

Compliance with the summary of suppression policy is mandatory. The principles of organization (summary and job descriptions) are essential to good fire management. Improved fire suppression is certain to result from the judicious application of the data in this handbook. Regional averages are the basis for much of the factual information contained in the tables, graphs and computer. These may be adjusted or modified to meet specific field situations, but any adjustments should be based upon fact and not opinion.

SUPPRESSION POLICY DIGEST

II

II FIRE SUPPRESSION POLICY DIGEST

1. The fire suppression policy of the Forest Service is to require fast, energetic and thorough suppression of all fires burning (a) on National Forest lands, (b) on other intermingled or adjacent lands when such fires constitute a threat to National Forest lands, or (c) on lands the protection of which is a contractual obligation of the Forest Service.

2. Ten O'Clock Control - When first attack forces fail to suppress a fire, the policy then calls for prompt calculation of the problems of the existing situation and probabilities of spread; organizing and activating adequate strength to control every such fire before 10 o'clock the following morning. Failing in this effort, the attack each succeeding day will be planned and executed with the aim of obtaining control before ten o'clock the next morning.

3. Relationship of Values to Suppression Costs - In all areas, control action should be energetic and aimed at 10 o'clock control and as much earlier as possible. Action in low value areas should materially reduce suppression costs and insure prompt control even though some sacrifice in acreage is involved.

4. Timber Sale Areas - A competent forest officer will be dispatched to all fires on National Forest timber sale areas to be fire boss.

5. Private Woods Operating Areas - The Forest Service is responsible for control of fires in operating areas within national forest protection boundaries.

6. Individuals will be assigned fire suppression positions on the basis of recognized fire suppression capabilities and without regard to administrative position.

III

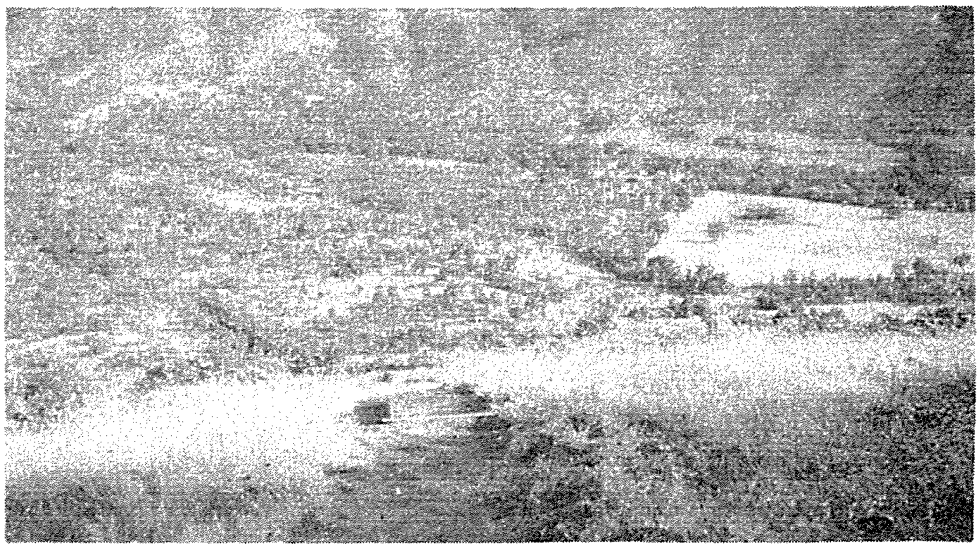
ESTIMATING GUIDES

FIRE PLANNING

BASIS AND USE OF ESTIMATING GUIDES

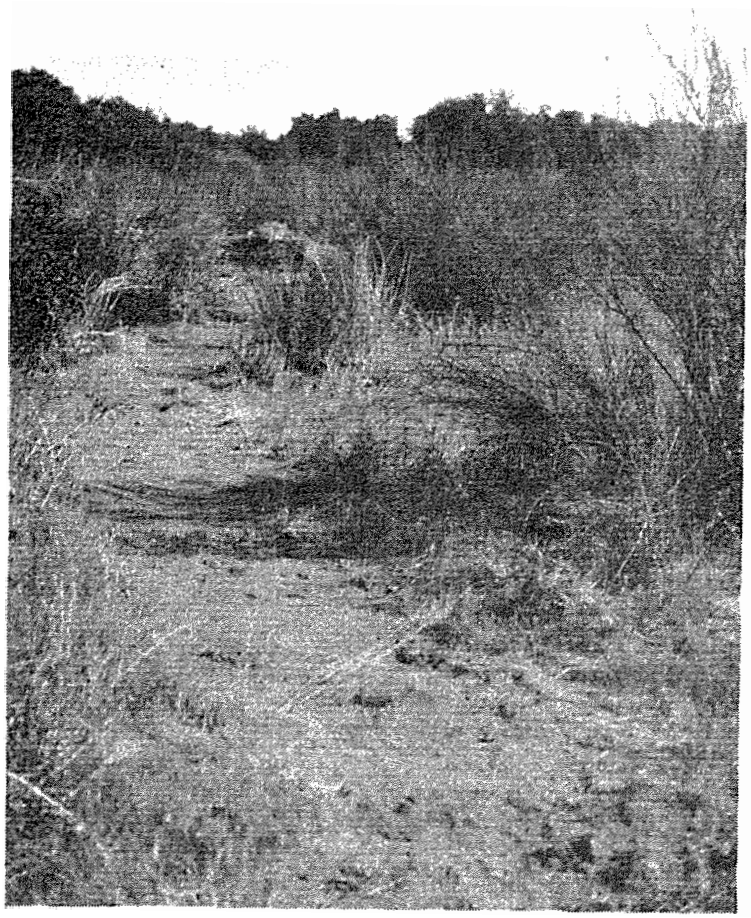
The determination of probable fire spread must be based upon the history of the fire to date. This history is expressed in terms of forward spread in chains per hour under specific conditions of fuel moisture, wind, slope and cover. Control force requirements are based upon the chains of fire perimeter requiring action and include the primary considerations of: (1) quality of control forces, (2) type of treatment, and (3) fuel type.

The estimating guides are in a form suitable for rapid field application. The computer and graphs or tables are different presentations of the same data. Individuals may select the one that is most suitable to his personal requirements and modify the results by careful judgment.



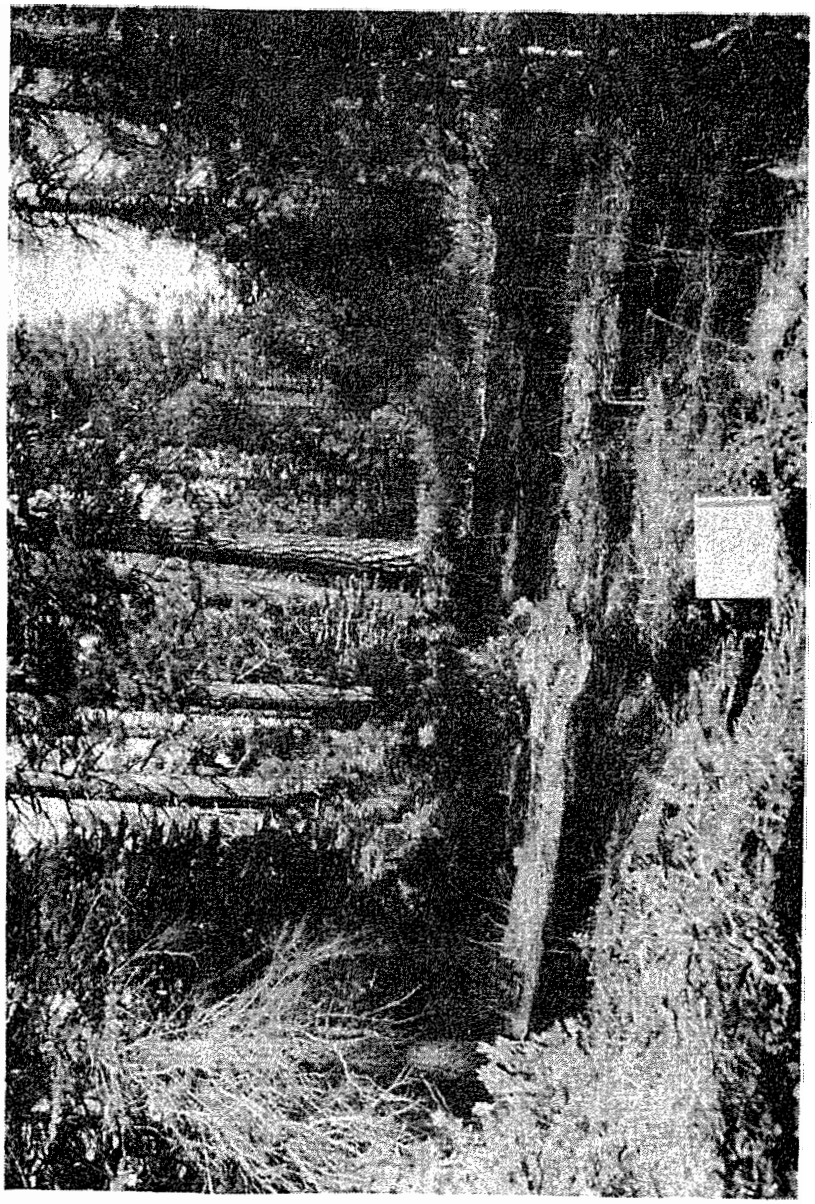
FUEL TYPE 1

Grass



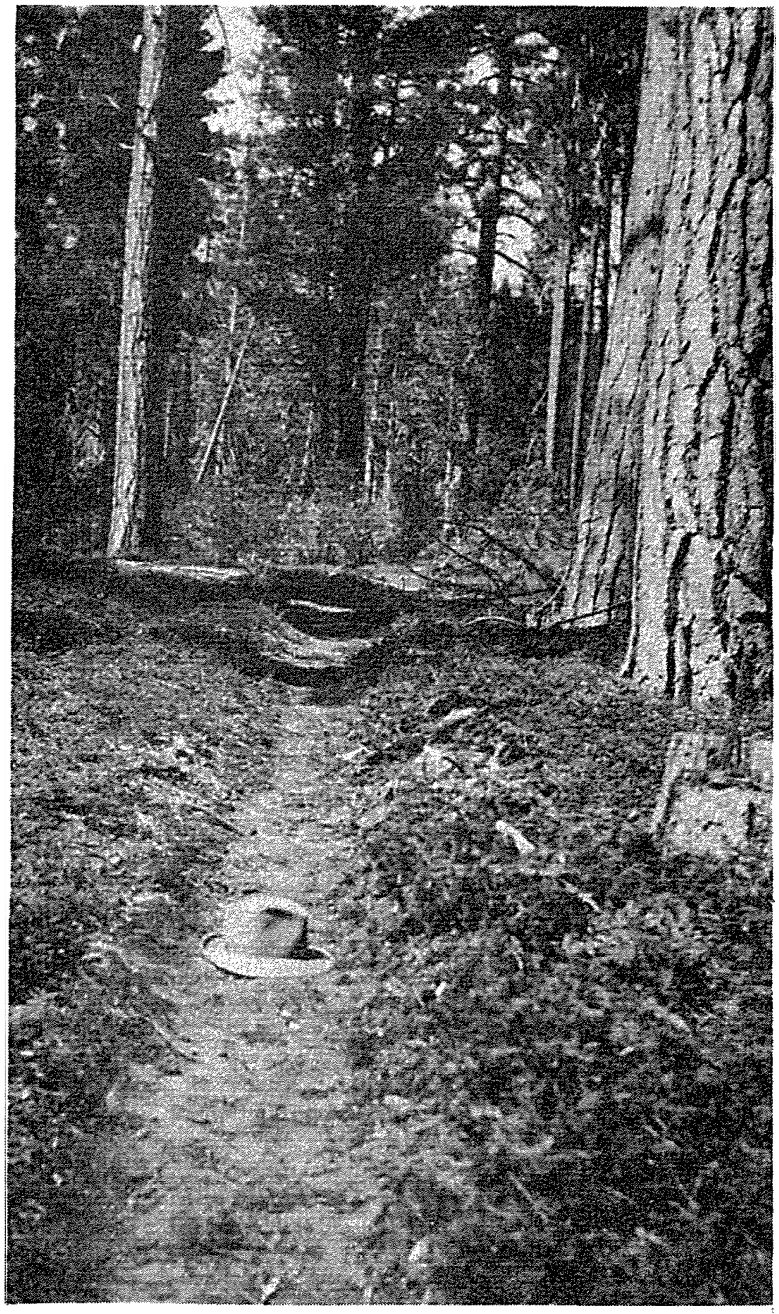
FUEL TYPE 2

Grass and scattered sage



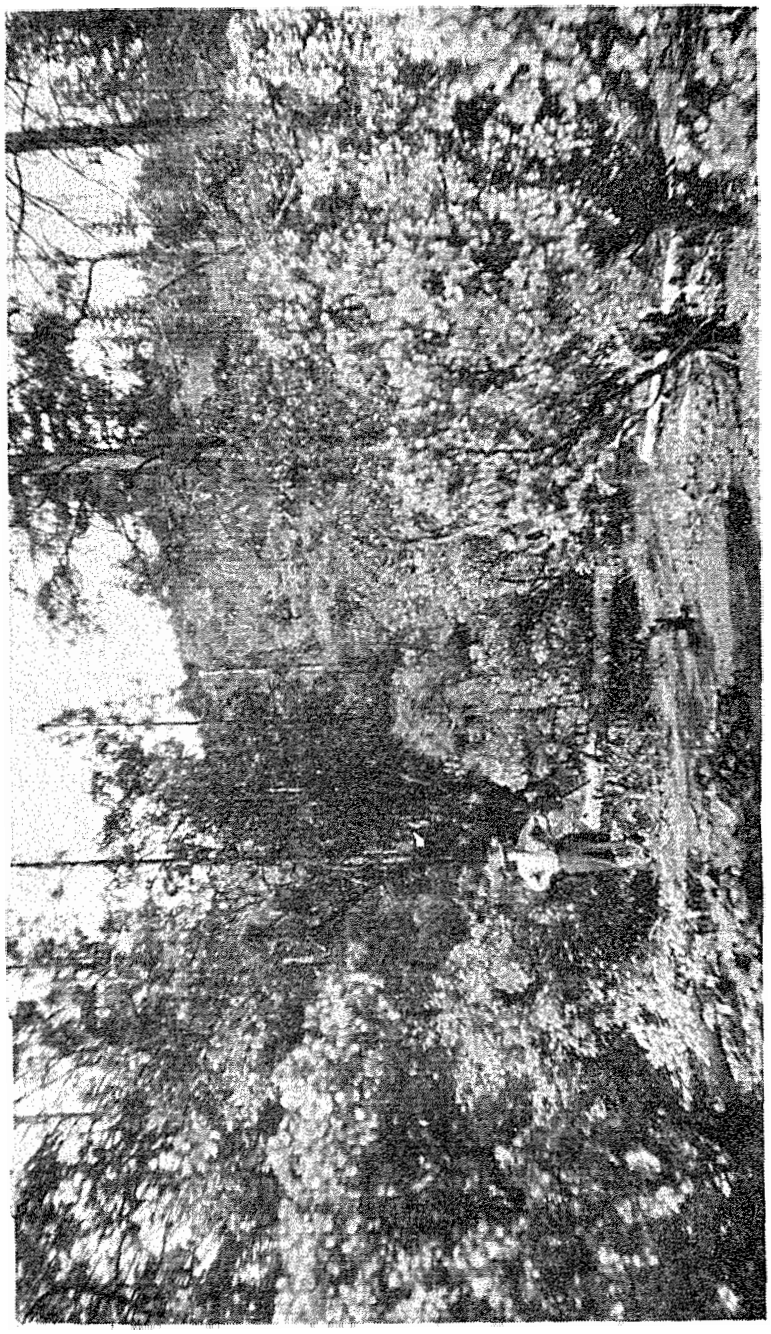
FUEL TYPE 3

Mature Timber - Little Chopping



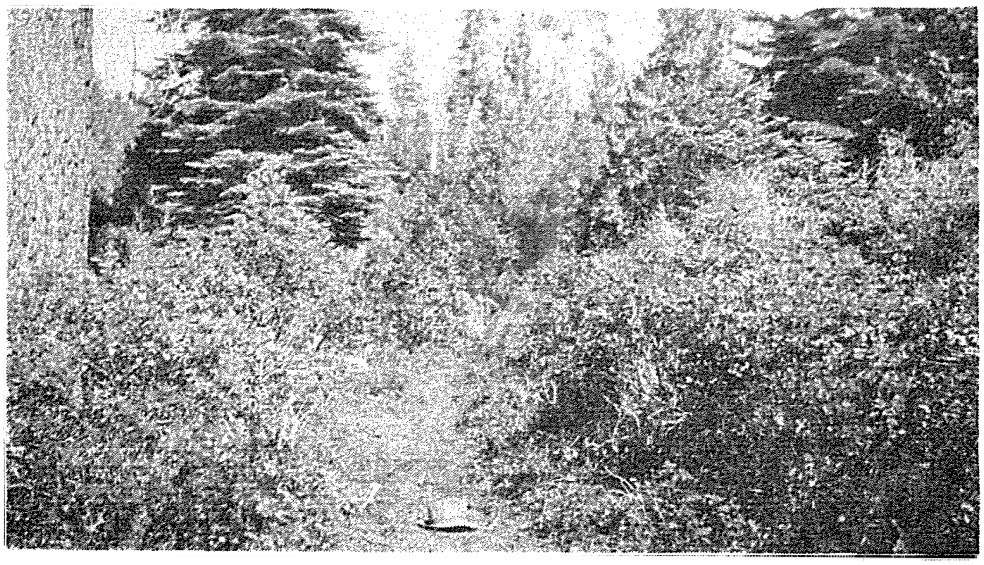
FUEL TYPE 4

Bear clover



FUEL TYPE 5

Open manzanita - patchy brush

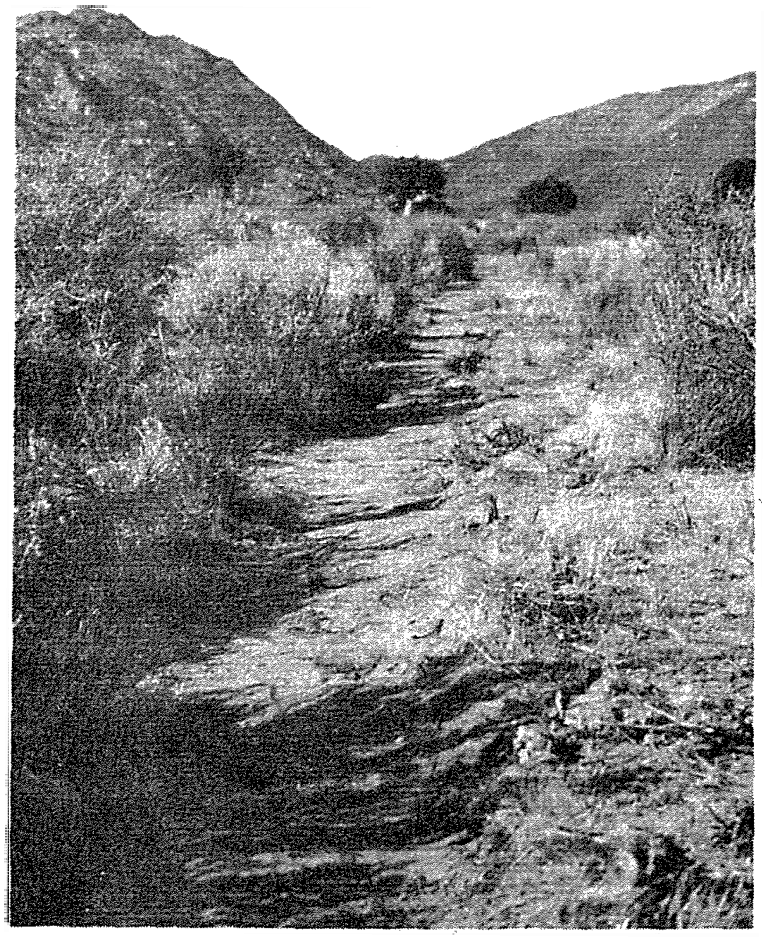


FUEL TYPE 6

Timber - medium reproduction and brush

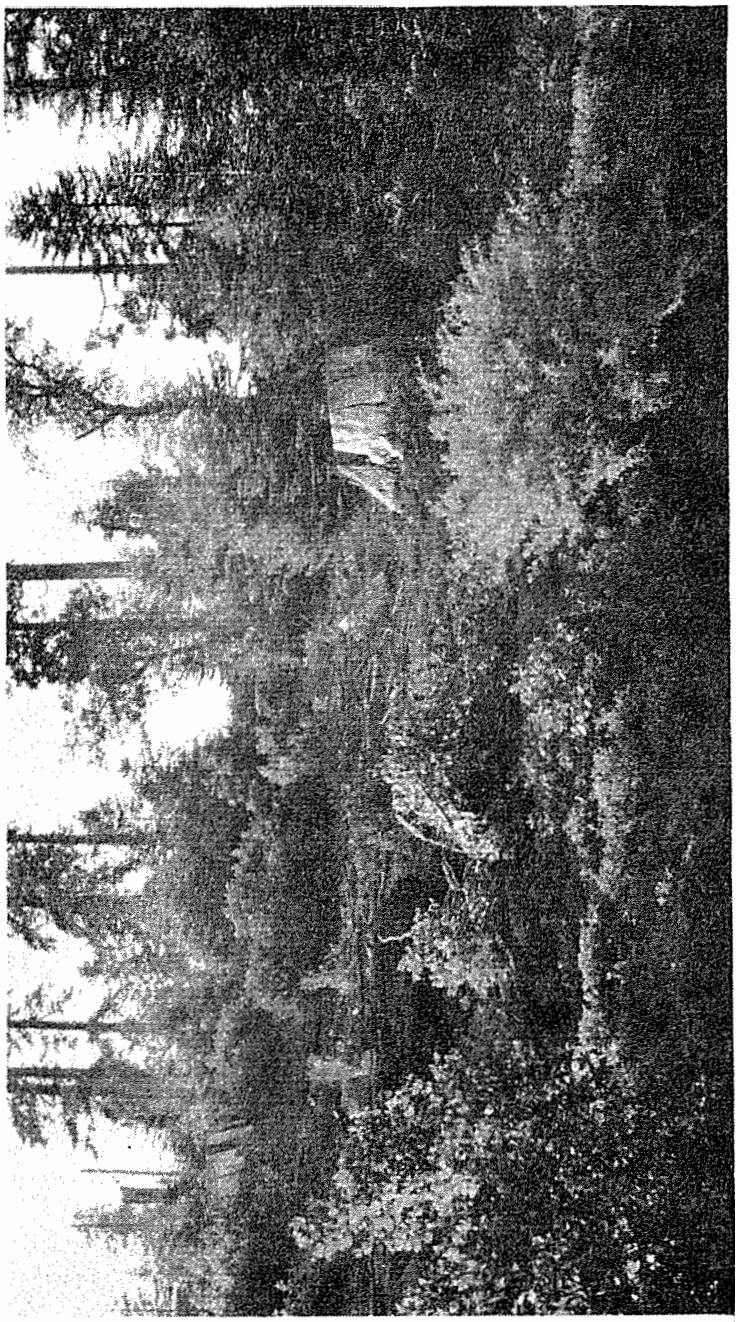
FUEL TYPE 7

Light to medium chamise - So. Calif



FUEL TYPE 8

Brush mixture with sage



FUEL TYPE 9

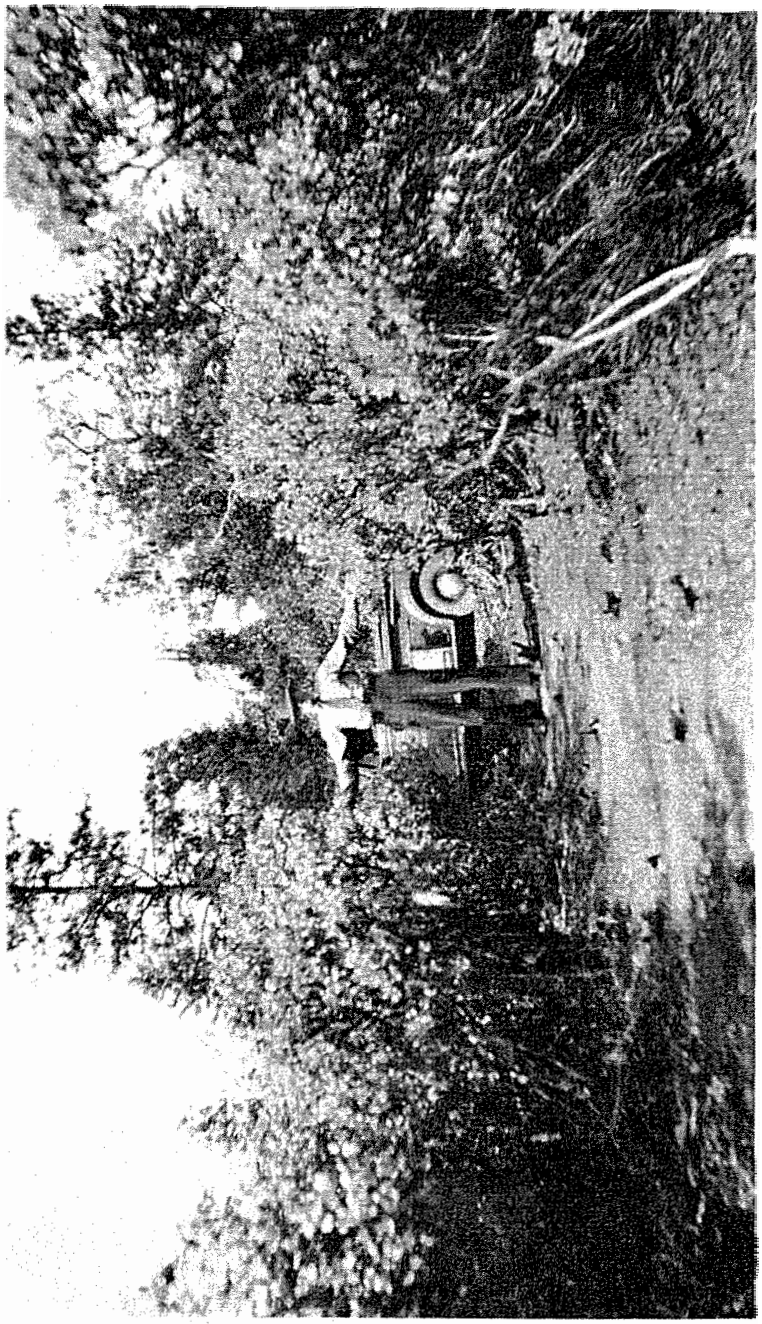
Medium brush - in cut-over or timber burn

FUEL TYPE 10

Mixed douglas fir - white fir
with brush and reproduction

FUEL TYPE 11

Medium brush and oak - So. Calif.

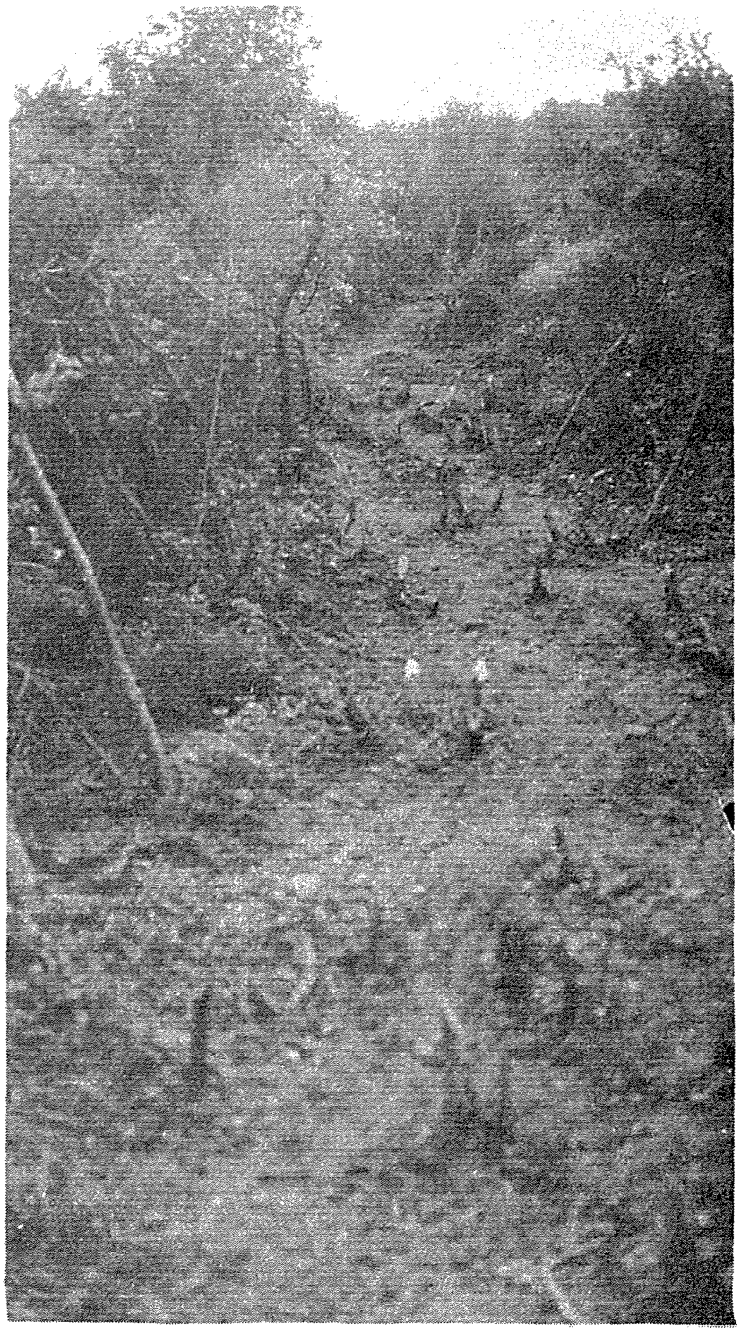


FUEL TYPE 12

Heavy pure manzanita, chamise
or buck brush

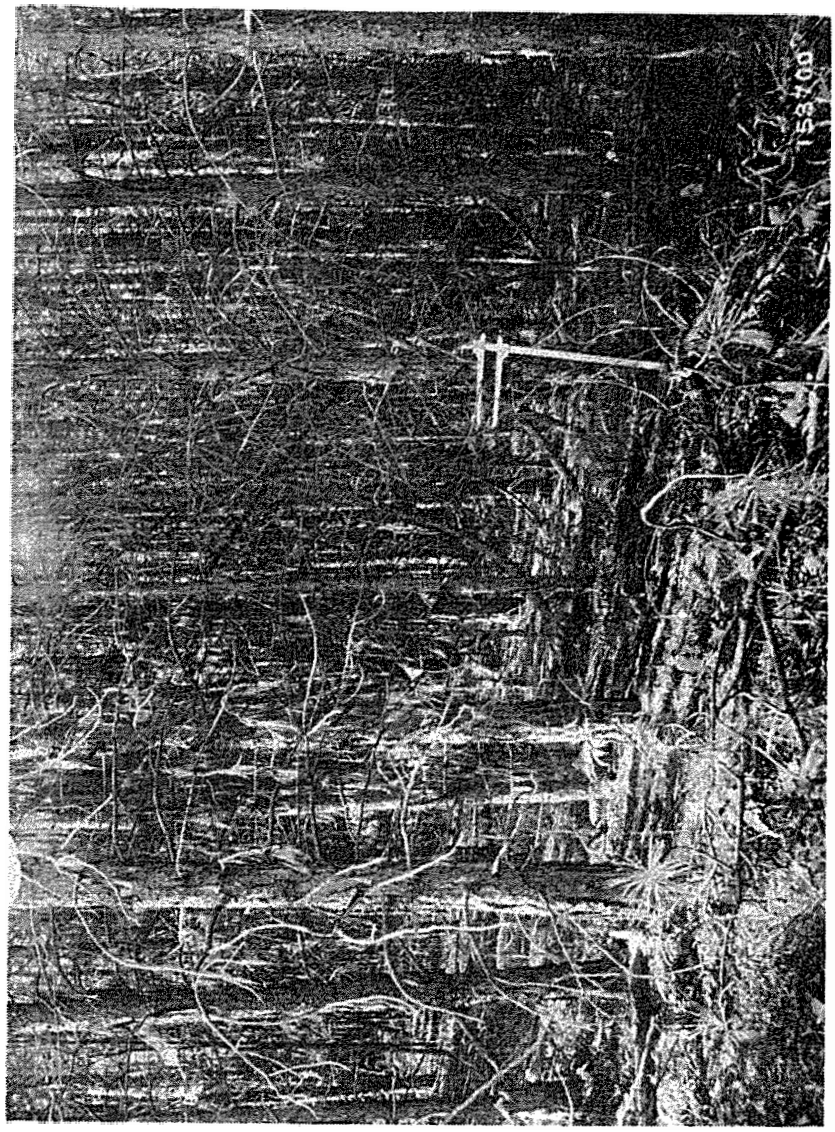
FUEL TYPE 13

Heavy mixed brush



FUEL TYPE 14

Heaviest mixed brush

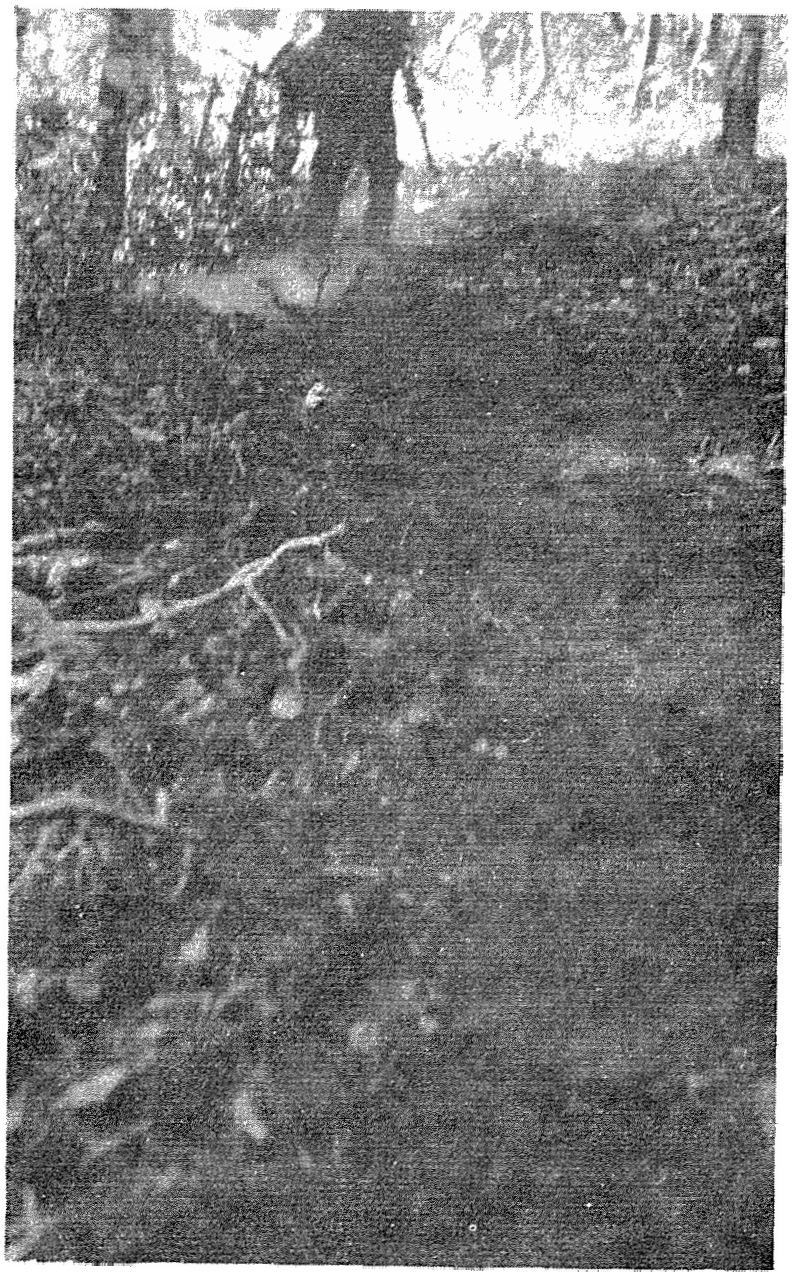


FUEL TYPE 15

Second growth - medium poles

FUEL TYPE 16

Slash in cut-overs



FUEL TYPE 17

Woodland - little chopping

COMPUTER - FORWARD RATE OF FIRE SPREAD

REGION 5, MODEL 48

(Computer is in pocket next to front cover)

The values used in the Computer for rate-of-spread factor, for the effect of fuel types, slope, wind velocity, and fuel moisture are based on research work in the field of rate of spread.

The Region 5 Computer was designed to aid in speedy calculation of:

1. Rate-of-spread factor -- is computed by taking into account changes in fuel type, slope, wind velocity, and fuel moisture. This factor multiplied by the observed past rate of spread gives the predicted rate of spread.

SAMPLE PROBLEM NO. 1

Example - Illustrating Use of Region 5, Model 48, Rate of Spread Computer for:

Predicting Rate of Spread

What is the predicted rate-of-spread factor and the predicted rate of spread under the following conditions?

1. Given: Past History. Fire has been burning (Observed)
   a. in Type 6 (Timber - Medium Reproduction and Brush)
   b. on an up slope of 0 to 5%.
   c. with a wind of 6 miles per hour.
   d. with a fuel moisture of 5.5%.
   e. forward rate of spread measured on map of fire along a representative axis - 10 chains per hour. (It is necessary to measure and compute past rate of spread on other significant axis for use in predicting spread along other significant axis.).

2. What is the predicted rate of spread under the new conditions given below?
   a. in Type 8, Brush mixture with sage.
   b. on an up slope of 12%.
   c. with a predicted wind of 10 miles per hour.
   d. with a fuel moisture of 3%.

SOLUTION (By use of Model 48, Region 5 Computer)

1. Set index line on Arm Y to I (in diamond) on outer scale (rate of spread scale).
2. Hold Arm Y fixed.
3. Set Type 6 mark on Scale A (fuel type) of Disc Z to index line on Arm Y.
4. Move Arm Y to Type 8 mark on Disc Z.
5. Hold Arm Y fixed.
6. Shift Disc Z until arrow for ± 0 to 5% on Scale B is under index line on Arm Y.
7. Shift Arm Y to arrow on scale B (Slope) for the predicted + 5 to 19% slope.

8. Hold Arm Y fixed.
9. Shift Disc Z until the 6 mph or Scale C (wind) is under the index line on Arm Y.
10. Shift Arm Y to predicted 10 mph wind graduation on Scale C.
11. Hold Arm Y Fixed.
12. Shift Disc Z until the 5.5% fuel moisture graduation on Scale D (fuel moisture) is under the index line on Army Y.
13. Shift Arm Y to the predicted 3% fuel mositure graduation on Scale D.
14. On rate of spread scale read 8, the rate-of-spread factor.
15. Then 8 times the observed rate of spread along this axis of the fire of 10 chains per hour, gives the predicted rate of spread. 8x10 or 80 chains per hour is the predicted rate of spread for the given set of predicted conditions for this axis of the fire. (Repeat similar computations for other significant axis of spread and plot on map of fire to get predicted perimeter.)

NOTE:

The scale marked ± 0 to 5% is used for either plus or minus slopes of 0 to 5%, since for all practical purposes this slope range is considered nearly level. For plus slopes over 5% the scale increses in a clockwise direction; for minus slopes over 5% the scale increases in a counter clockwise direction. The vertical arrows on this (B) scale designate the middle of the slope classes; for example, the arrow in the (-) 20 to 39% bracket represents the median (29 or 30) in the -20 to 39% slope class. A -20% slope in this (-) 20 to 39% bracket would be to the right of the small vertical index arrow, and a 35% slope would be to the left of the vertical index arrow.

ALINEMENT CHARTS

LINE CONSTRUCTION CHARTS, LINE HOLDING CHARTS, AND LINE CONSTRUCTION AND HOLDING CHARTS

The alinement charts on the following pages can be used to rapidly compute problems concerned with manpower required to construct and hold various lengths of fire line in certain fuel types within varying intervals of time. In working these problems it is necessary to consider the four elements -- fuel type, time, number of men, and length of line. If any three of the four elements are known or predetermined, the fourth element can be computed on one of the following alinement charts. For example, by first determining the fuel type in which a fire is burning from the preceding photos, the alinement charts can be used to rapidly compute

1. The number of men needed to

   a. Construct a given length of line in a given number of hours, or

   b. Hold a given length of line in a given number of hours, or

   c. Construct and hold a given length of line in a given number of hours.

2. The length of line (in chains) that can be

   a. Constructed by a given number of men in a given number of hours, or

   b. Held by a given number ot men in a given number of hours, or

   c. Constructed and held by a given number of men in a given number of hours.

3. The time (in hours) necessary to

   a. Construct a given length of line by a given number of men, or

b. Hold a given length of line by a given number of men, or

c. Construct and hold a given length of line by a given number of men.

The procedure for using the alinement charts can be explained by using sample problems.

Sample Problem No. 1

Solution desired: How many men would be required to construct 35 chains of line in fuel type 8 in six hours.

Procedure: Select chart I (Line Construction Chart -- All Fuel Types). Place a straight edge through point at Type 8 on Line A and through six hours on Line B. With a pin or pencil, mark and hold the point where the straight edge crosses the "X" line. Then, still holding the straight edge at this point on line "X" swing the straight edge around to cross line D at 35 chains and read the answer desired on line C. 7 men are needed.

Conversely: If you had a 7-man crew and had 35 chains of line to construct, how many hours would be required to complete the job.

Procedure: Place a straight edge through 7 men on line C and 35 chains on line D. Mark the point where the straight edge crosses the "X" line. Then, while still holding the straight edge at the point where it crosses the "X" line, swing the straight edge around to cross the A line at fuel type 8 and read six hours on line B.

NOTE:

In using the alinement charts it is always necessary to pair two similarly colored lines in conjunction with the "X" line. Lines A and B must be used together with the "X" line, and line C and D must be used together with the "X" line. A straight edge (ruler or edge of a piece of paper) placed through known values on either pair of lines will determine a point on the "X" line. Then this point on the "X" line together with the third known element on one of the other paired lines will determine the desired value on the remaining line.

Sample Problem No. 2

Solution desired: Manpower required to hold 35 chains of line in six hours in fuel type 8.

Procedure: Select chart III (Line Holding Chart for Fuel Types 2, 3, 4, 7, 8, 10, 12, and 17). Place a straight edge through point at Type 8 on Line A and through six hours on line B. With a pin or pencil, mark and hold the point where the straight edge crosses the "X" line. Then, holding the straight edge at this point on the "X" line, swing the straight edge around to cross line D at 35 chains and read approximately 1 man on line C.

Sample Problem No. 3

Solution desired: Manpower required to construct and hold 35 chains of line in six hours in fuel type 8.

Procedure: Select Chart VI (Line Construction and Holding Chart for Fuel Types 1, 2, 3, 4, 7, 8, 10, 12, and 17). Place a straight edge through point at Type 8 on line A and through six hours on line B. With a pin or pencil, mark and hold the point where the straight edge crosses the "X" line. Then holding the straight edge at this point on the "X" line, swing the straight edge around to cross line D at 35 chains and read 7 + on line C. Eight men would be required to do the job.

Conversely: If you had an 8-man crew and had only six hours in which to construct and hold line in fuel type 8 before 9:00 a.m., how many chains of line could you reasonably expect them to complete in six hours.

Procedure: Place straight edge on fuel type 8 on line A and six hours on line B. Hold the point where it crosses line "X" and swing the straight edge to 8 men on line C and read 38 chains on line D.

Sample Problem No. 4

Solution desired: How many men are required to construct and hold 300 chains of line in fuel type 3 in five hours.

Procedure: Select Chart VI (Line Construction and Holding Chart for Fuel Types 1, 2, 3, 4, 7, 8, 10, 12, and 17). Place straight edge at Type 3 on line A and at five hours on line B. Hold point where straight edge crosses the "X" line line, swing the straight edge around to cross line D at 100 chains, and read approximately 12 men where the straight edge crosses line C. Since 100 chains is only 1/3 of 300 chains, we multiply 12 by 3 and get 36 men required for the job.

NOTE:

Solutions computed on these alinement charts should not be considered as being absolutely correct, but as reasonable guides or approximations. The alinement charts are not effective beyond eight hours. The values for line construction rates for each fuel type were determined by actual field tests in line construction with selected crews. The work was done with seasoned crews, under competent leadership, during daylight hours under average topographic, fuel density, and soil conditions. It is necessary to apply a judgment correction on any given fire for variations from these conditions. Allowances have been made for periodic rest periods and cumulative fatigue (see table, page 18).

The values for line holding by fuel types are based on seasoned judgment as to the number of men and length of time required to hold fire line constructed at given rates in the various fuel types. Holding values do not include men required to construct, backfire, mop-up, (except incidental) or patrol (see table, page 19).

AGRICULTURE—FOREST SERVICE—SAN FRANCISCO

Sample Problem No. 2

Solution desired: Manpower required to hold 35 chains of line in six hours in fuel type 8.

Procedure: Select chart III (Line Holding Chart for Fuel Types 2, 3, 4, 7, 8, 10, 12, and 17). Place a straight edge through point at Type 8 on Line A and through six hours on line B. With a pin or pencil, mark and hold the point where the straight edge crosses the "X" line. Then, holding the straight edge at this point on the "X" line, swing the straight edge around to cross line D at 35 chains and read approximately 1 man on line C.

Sample Problem No. 3

Solution desired: Manpower required to construct and hold 35 chains of line in six hours in fuel type 8.

Procedure: Select Chart VI (Line Construction and Holding Chart for Fuel Types 1, 2, 3, 4, 7, 8, 10, 12, and 17). Place a straight edge through point at Type 8 on line A and through six hours on line B. With a pin or pencil, mark and hold the point where the straight edge crosses the "X" line. Then holding the straight edge at this point on the "X" line, swing the straight edge around to cross line D at 35 chains and read 7 ½ on line C. Eight men would be required to do the job.

Conversely: If you had an 8-man crew and had only six hours in which to construct and hold line in fuel type 8 before 9:00 a.m., how many chains of line could you reasonably expect them to complete in six hours.

Procedure: Place straight edge on fuel type 8 on line A and six hours on line B. Hold the point where it crosses line "X" and swing the straight edge to 8 men on line C and read 38 chains on line D.

Sample Problem No. 4

Solution desired: How many men are required to construct and hold 300 chains of line in fuel type 3 in five hours.

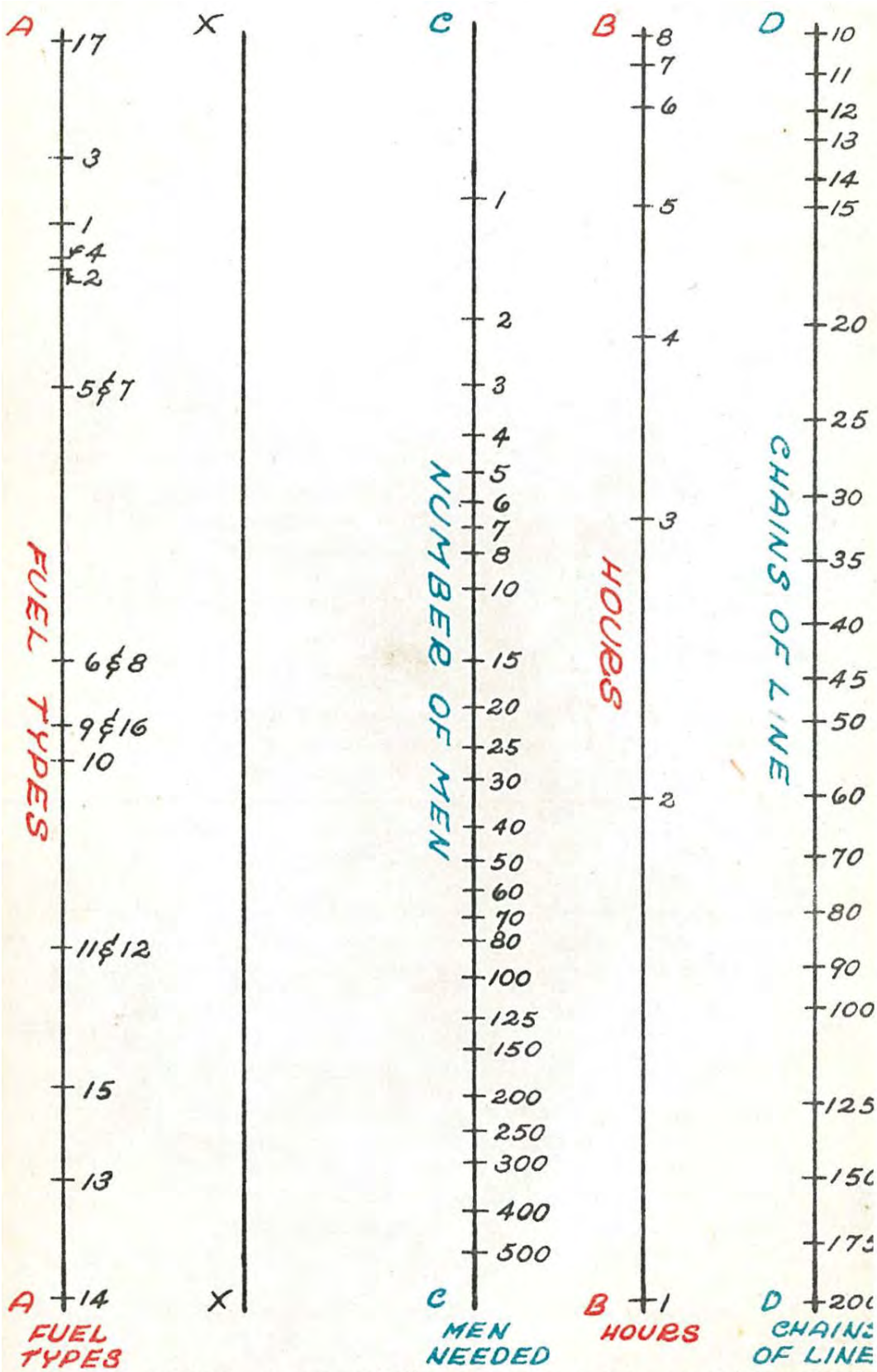
Procedure: Select Chart VI (Line Construction and Holding Chart for Fuel Types 1, 2, 3, 4, 7, 8, 10, 12, and 17). Place straight edge at Type 3 on line A and at five hours on line B. Hold point where straight edge crosses the "X" line line, swing the straight edge around to cross line D at 100 chains, and read approximately 12 men where the straight edge crosses line C. Since 100 chains is only 1/3 of 300 chains, we multiply 12 by 3 and get 36 men required for the job.

NOTE:

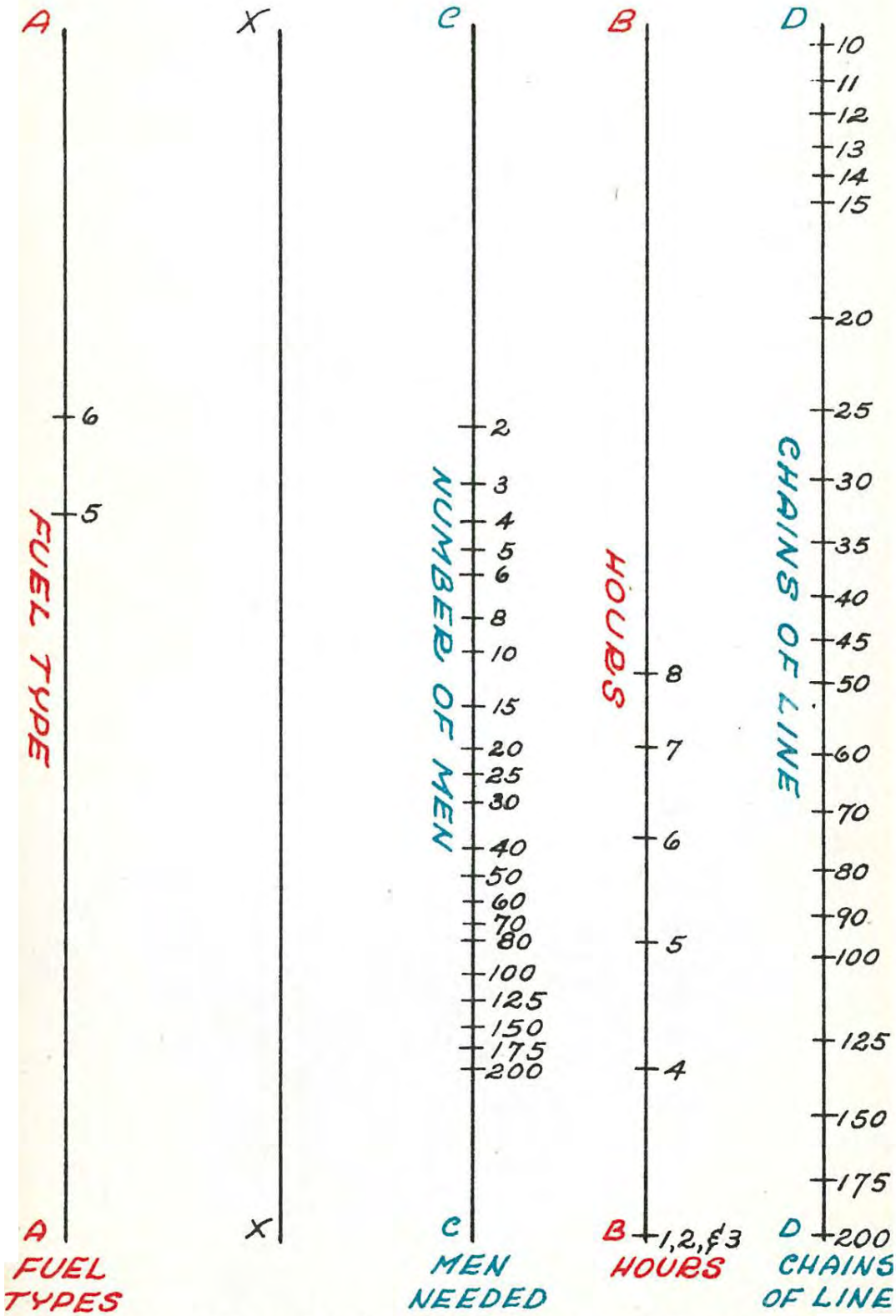
Solutions computed on these alinement charts should not be considered as being absolutely correct, but as reasonable guides or approximations. The alinement charts are not effective beyond eight hours. The values for line construction rates for each fuel type were determined by actual field tests in line construction with selected crews. The work was done with seasoned crews, under competent leadership, during daylight hours under average topographic, fuel density, and soil conditions. It is necessary to apply a judgment correction on any given fire for variations from these conditions. Allowances have been made for periodic rest periods and cumulative fatigue (see table, page 18).

The values for line holding by fuel types are based on seasoned judgment as to the number of men and length of time required to hold fire line constructed at given rates in the various fuel types. Holding values do not include men required to construct, backfire, mop-up, (except incidental) or patrol (see table, page 19).

AGRICULTURE—FOREST SERVICE—SAN FRANCISCO

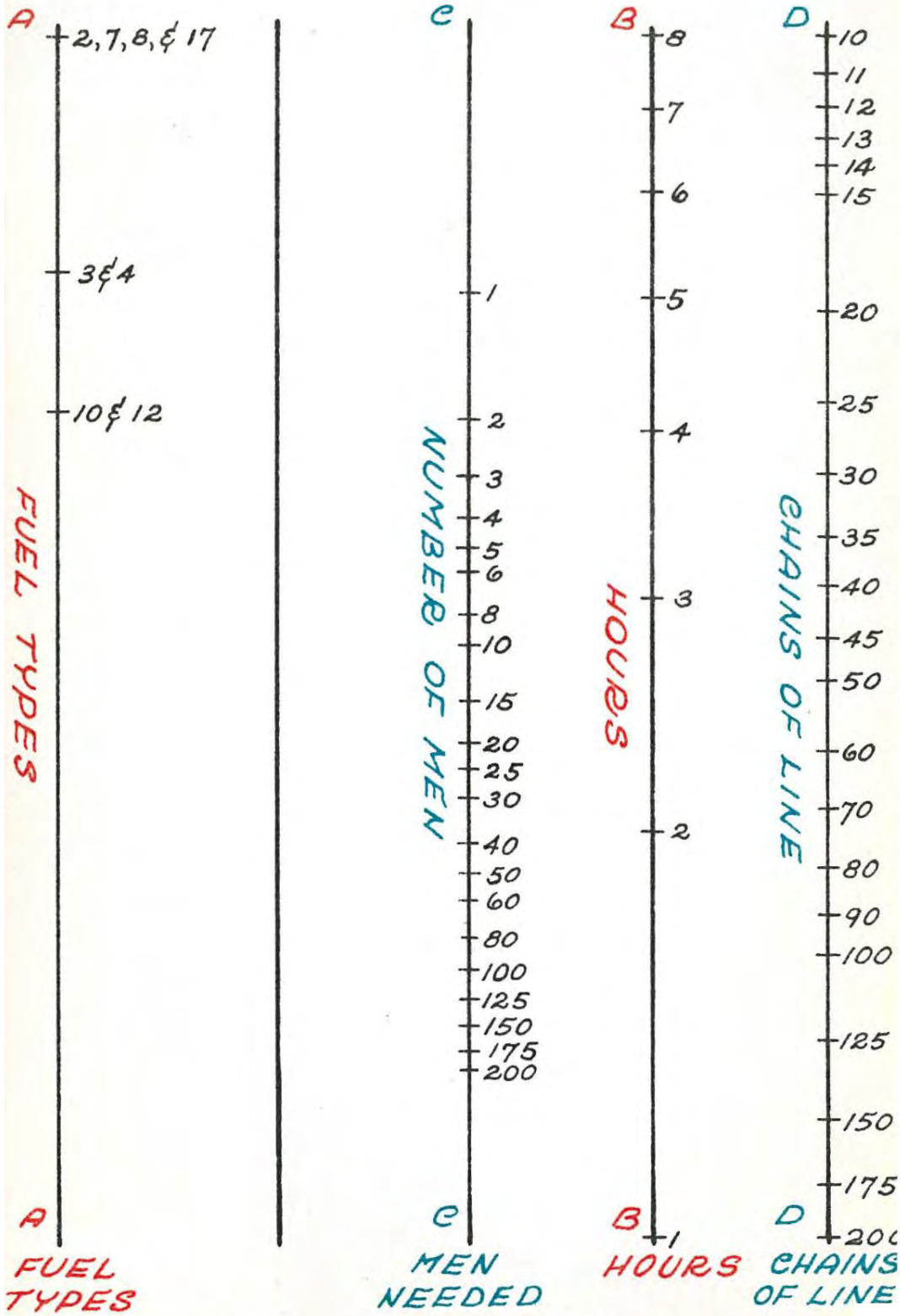


I LINE CONSTRUCTION CHART
ALL FUEL TYPES

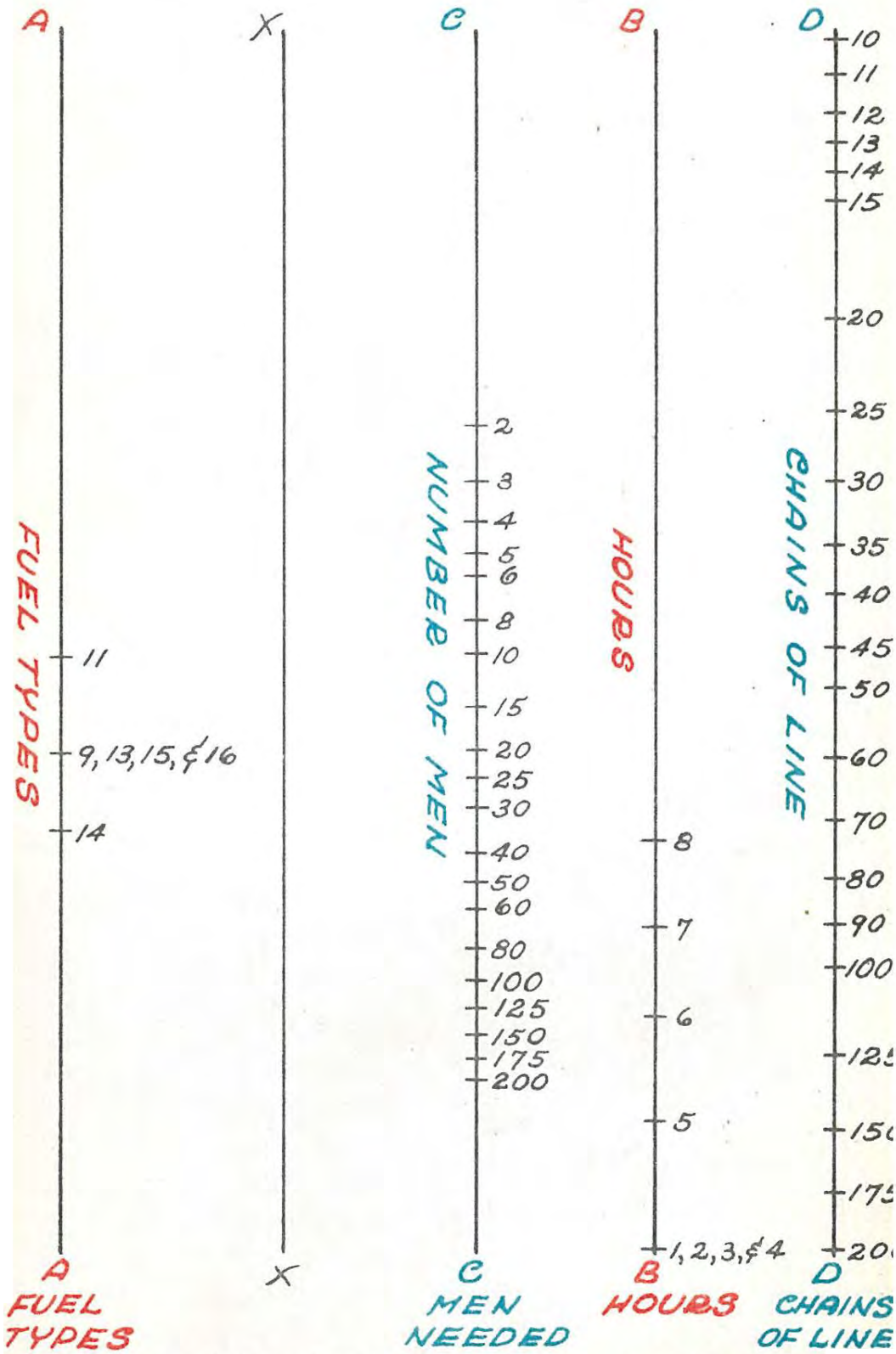


II LINE HOLDING CHART
FUEL TYPES 5 & 6

8f



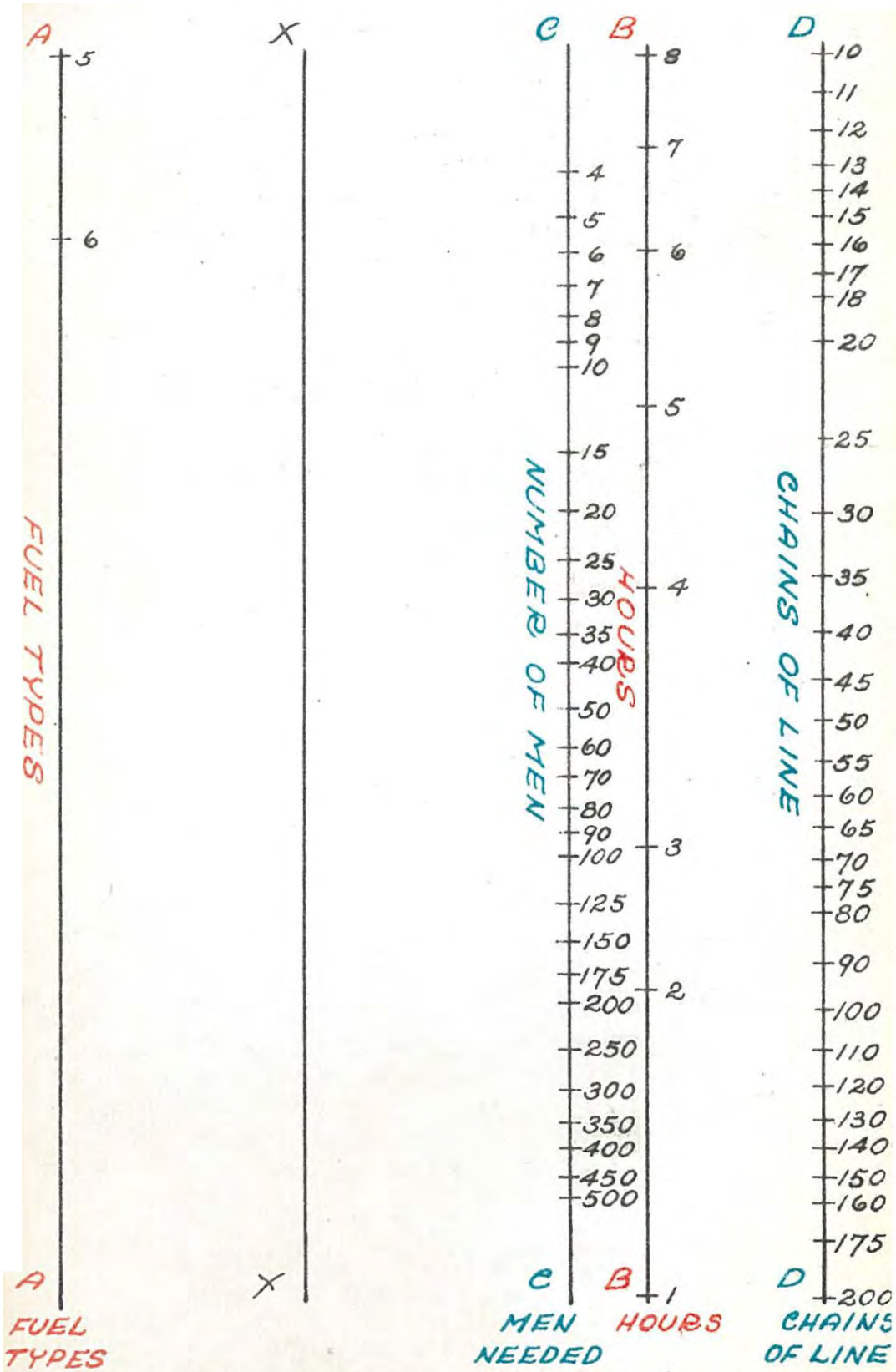
III LINE HOLDING CHART
FUEL TYPES 2, 3, 4, 7, 8, 10, 12 & 17



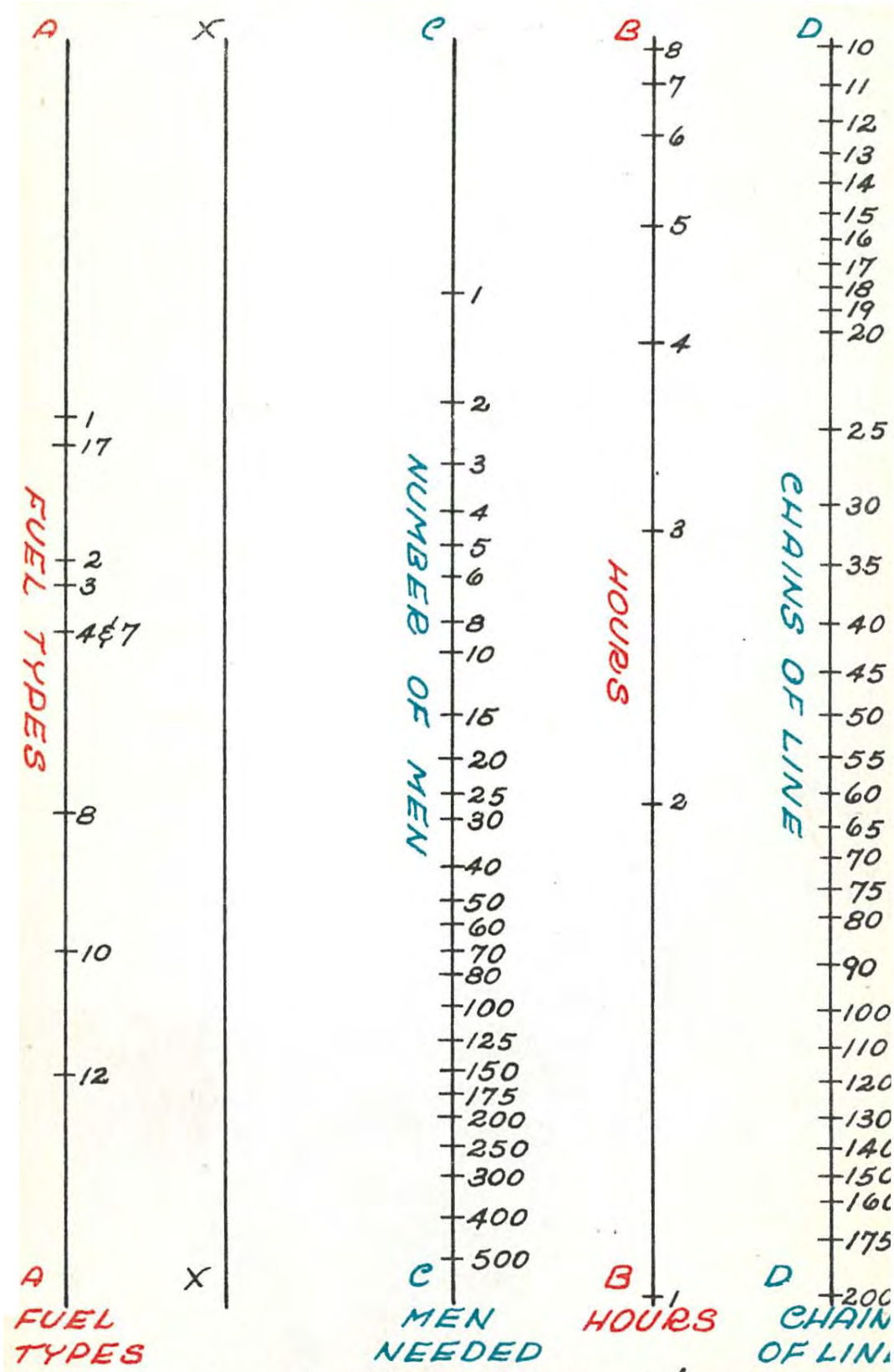
IV LINE HOLDING CHART

FUEL TYPES 9, 11, 13, 14, 15, & 16

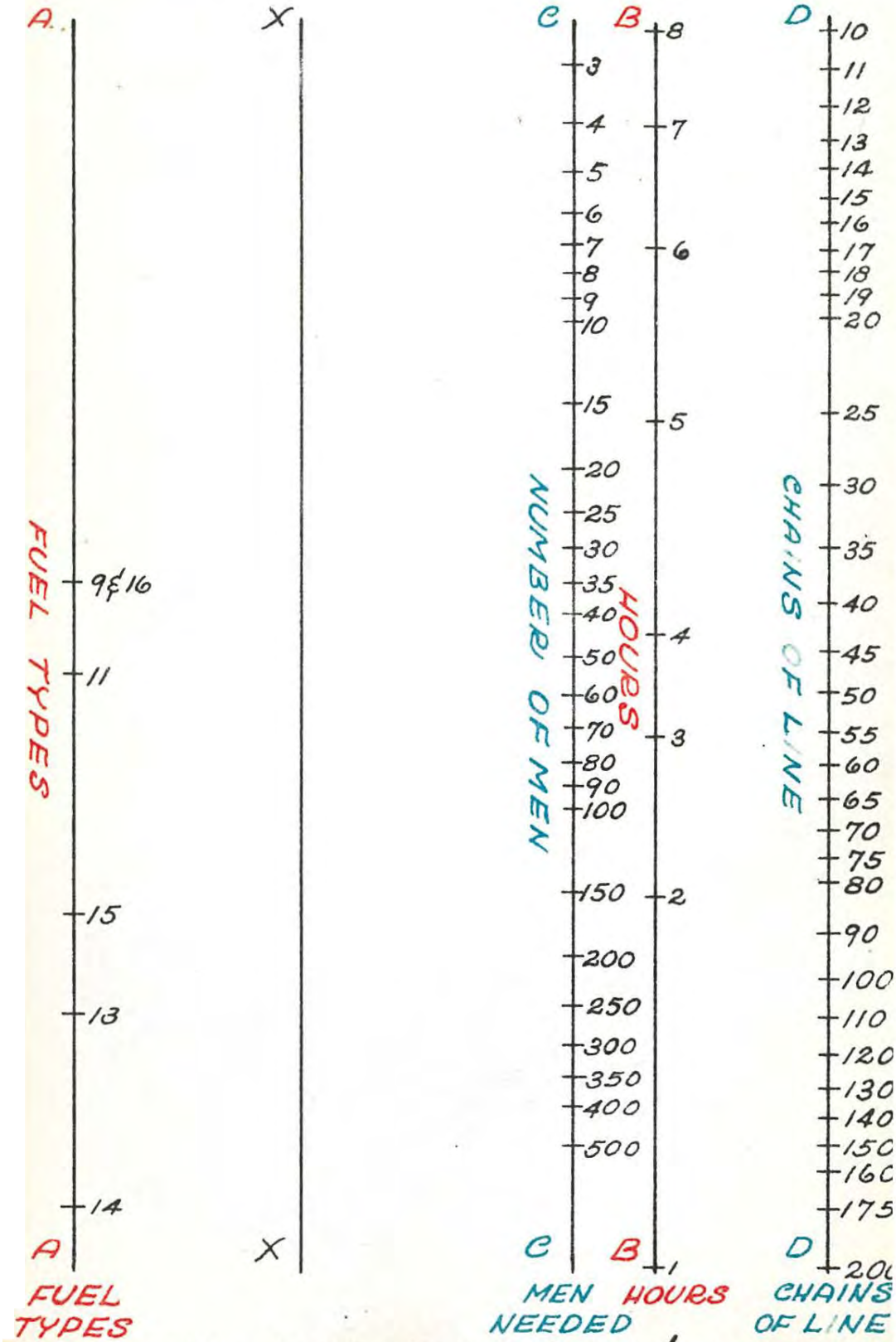
8 h



V LINE CONSTRUCTION & HOLDING
FUEL TYPES 5 & 6



VI LINE CONSTRUCTION & HOLDING
FUEL TYPES 1, 2, 3, 4, 7, 8, 10, 12 & 17



VII LINE CONSTRUCTION & HOLDING
FUEL TYPES 9, 11, 13, 14, 15 & 16

8 k

TRAILBUILDER

PERFORMANCE GUIDES*

FOR FIRE CONTROL PLANNING

TABLE

1. Travel Times.

2. Maximum Slopes for Ascending or Descending with blade raised.

3. Maximum Safe Side Slope for Cross Country Travel with blade raised-Forward Gear.

4. Rates of single pass Fire Line Construction - Down Grade and Up Grade.

5. Rates of Fire Line Construction-Side Slope.

*Based on field tests, as reported in Equipment Development Report No. 13, April, 1948, Arcadia Equipment Development Center.

These tests were made under ideal conditions since neither serious rock outcrop or logs were encountered on the testing grounds. The results approach the maximum rates rather than average. Therefore, judgment must be used to adjust the rates in the tables in accordance with actual conditions encountered to get anticipated performance.

TABLE 1
TRAVEL TIME - TRAILBUILDERS

Road Type	D-8 Ave.mi. PER hour	D-7 Ave.mi. per hour	D-6 Ave.mi. per hour	D-4 Ave.mi. per hour
City Streets	20	20	20	20
Typical Cross Country Highway	35	35	35	35
Typical Mountain Highway	14	16	18	20
Walking Time - Dirt Roads	4	5	5.5	5

TABLE 2
MAXIMUM SLOPES FOR ASCENDING AND
DESCENDING WITH BLADE RAISED

Gear	D-8		D-7		D-6		D-4	
	Upgrade %	Down-grade %	Upgrade %	Down-grade %	Upgrade %	Down grade %	Upgrade %	Down-grade %
MEDIUM BRUSH								
Forward Gear	75	75	73	73	70	70	67	67
Reverse Gear	46	80	45	80	44	80	40	80
HEAVY BRUSH								
Forward Gear	52	70	50	65	48	65	45	60
Reverse Gear	35	80	35	80	35	80	35	70

TABLE 3
MAXIMUM SAFE SIDE SLOPE FOR CROSS-COUNTRY
TRAVEL WITH BLADE RAISED - FORWARD GEAR

Type Brush	D-8		D-7		D-6		D-4	
	Medium	Heavy	Medium	Heavy	Medium	Heavy	Medium	Heavy
Max.Side Slope %	50	50	50	50	50	50	50	50

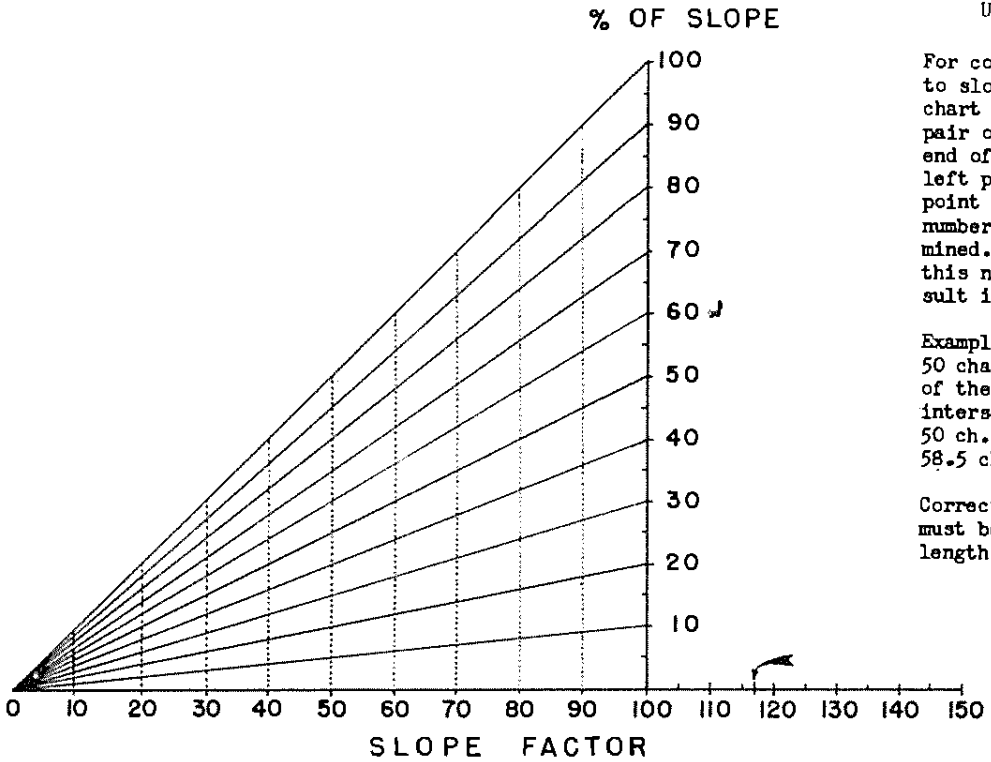
TABLE 4
RATE OF SINGLE PASS FIRE LINE CONSTRUCTION

Percent Slope	Rate of Construction chains/hour							
	D-8		D-7		D-6		D-4	
	Down-grade	Up-grade	Down-grade	Up-grade	Down-grade	Up-grade	Down grade	Up-grade
MEDIUM BRUSH								
0	50	50	50	50	50	50	50	50
10	50	50	50	48	50	39	50	35
20	52	45	52	37	52	30	52	27
30	54	40	54	27	54	22	54	20
40	56	30	56	17	56	14	56	12
45	58	20	58	12	58	8	58	7
50	59	-	59	-	59	-	59	-
60	60	-	60	-	60	-	60	-
HEAVY BRUSH								
0	45	45	40	40	31	31	30	30
10	45	40	42	30	34	25	32	23
20	48	35	44	23	37	20	34	18
30	50	30	46	18	40	15	36	13
40	52	25	48	11	43	7	38	5
45	53	15	50	5	46	-	40	-
50	54	-	53	-	48	-	42	-
60	55	-	55	-	50	-	44	-

TABLE 5
SIDE SLOPE FIRE LINE CONSTRUCTION RATES WITH
BLADE ON TRAILBUILDER ANGLED OR STRAIGHT

Type Trailbuilder	Percent Side Slope	Line Construction ch/hr	
		Angled Blade	Straight Blade
D-8	10-30%	50	45
D-7	10-30%	50	45
D-6	10-30%	45	40
D-4	10-30%	40	40

SLOPE GUIDE



USE OF SLOPE GUIDE

For converting horizontal (map) distance to slope distance, select the line of the chart for the applicable slope %. Set a pair of dividers with its points on each end of the appropriate slope line. Hold left point of dividers fixed. Swing right point down until it intersects the bottom numbered scale. Read the number so determined. Multiply the horizontal distance by this number, point off two places; the result is the slope distance.

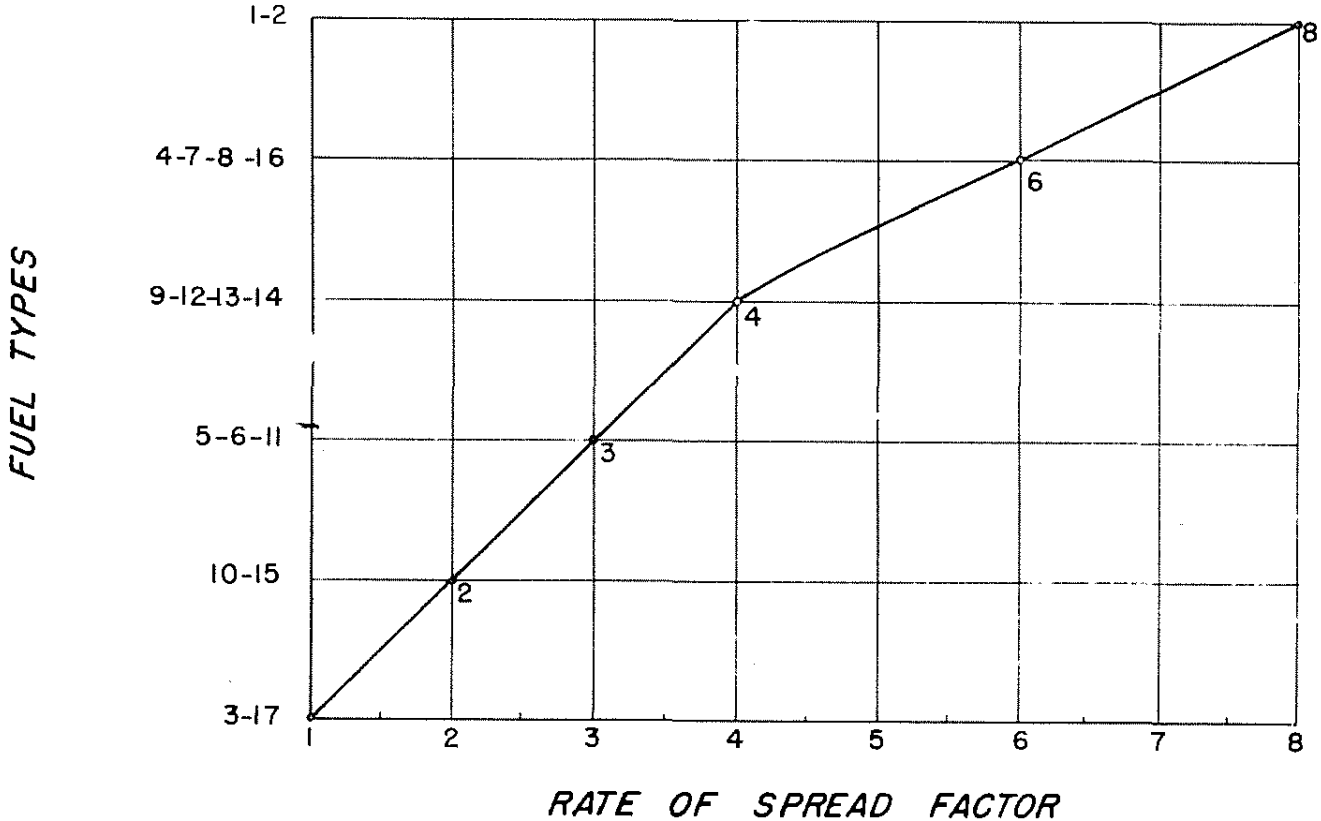
Example: 60% slope, horizontal distance 50 chains. Set divider points to each end of the 60% line; swing right leg down to intersect horizontal scale - read 117. 50 ch. x 117 5850. Point off two places 58.5 ch. slope distance.

Correction of map (horizontal) distance must be made for slope to give actual length of fire line to be worked.

GRAPH 1 OF 4 FOR RATE OF SPREAD RATIOS

FUEL TYPE FACTOR

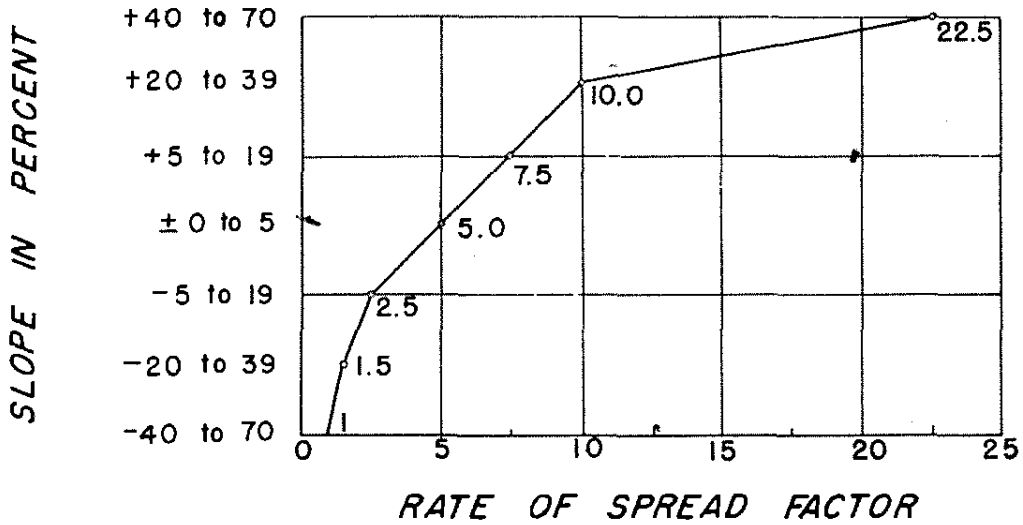
(See Graphs 2, 3 & 4)



GRAPH 2 OF 4 FOR RATE OF SPREAD RATIOS

SLOPE FACTOR

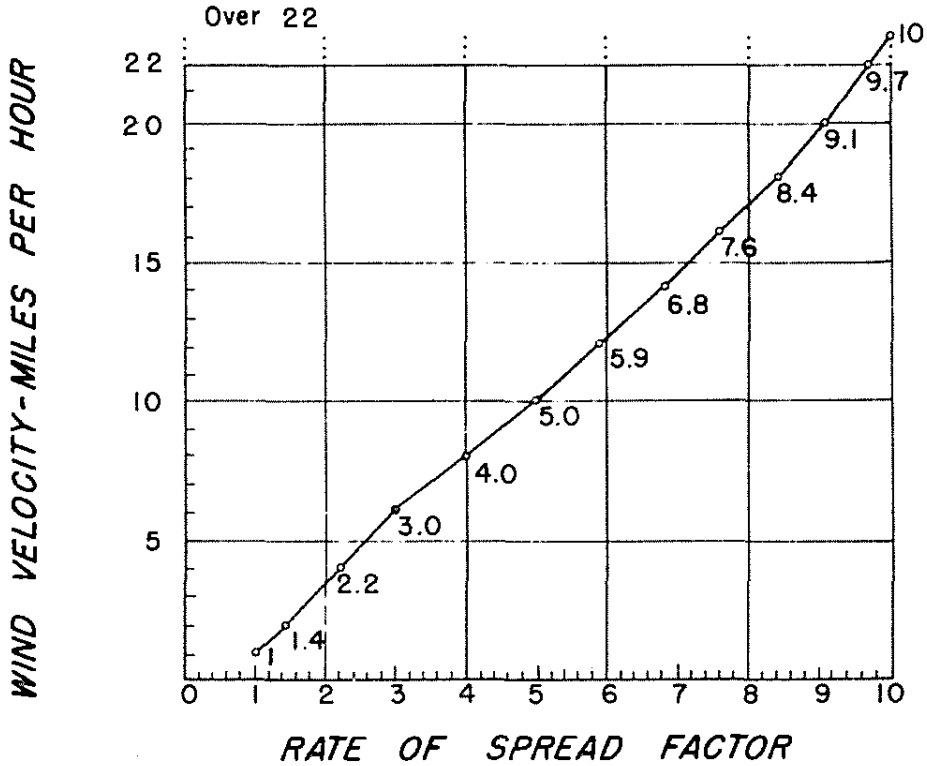
(See Graps 1,3 & 4)



GRAPH 3 OF 4 FOR RATE OF SPREAD RATIOS

WIND FACTOR

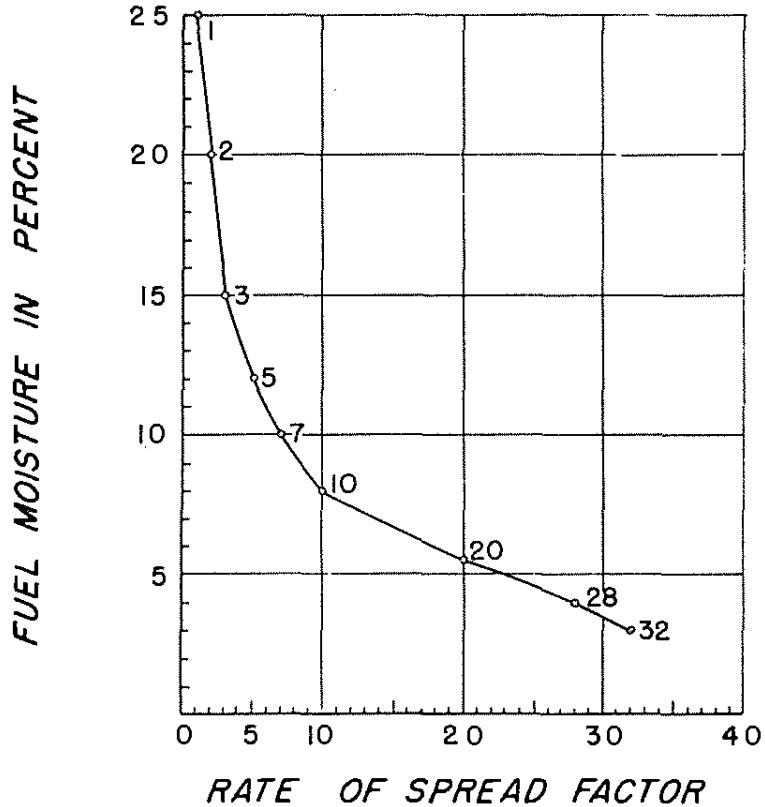
(See Graphs 1, 2 & 4)



GRAPH 4 OF 4 FOR RATE OF SPREAD RATIOS

FUEL MOISTURE FACTOR

(See Graphs 1, 2 & 3)



Use of Graphs 1 - 4 preceding

Example:

What is the predicted rate of spread under the following conditions?

	Past History	Predicted
Fuel Type	6	8
Slope %	+0-5%	+12% (5-19%)
Wind mph	6	10
Fuel Moisture %	5.5	3
Rate of Spread ch/hr	10	to be solved.

Solution:

(a) Fuel Type (See Graph 1)

$$\left\{\frac{\text{Past spread}}{\text{Predicted spread}}\right\} \frac{10}{X} :: \left\{\begin{matrix}\text{Type 6 factor}\\ \text{Type 8 Factor}\end{matrix}\right\} \frac{3}{6} = 20 \text{ ch/hr}$$

(b) Slope (See Graph 2)

$$\left\{\frac{\text{Spread Step (a)}}{\text{Predicted spread}}\right\} \frac{20}{X} :: \left\{\frac{+0\text{-}5\%}{+12\%}\right\} \frac{5}{7.5} = 30 \text{ ch/hr}$$

(c) Wind (See Graph 3)

$$\left\{\frac{\text{Spread Step (b)}}{\text{Predicted spread}}\right\} \frac{30}{X} :: \left\{\frac{6 \text{ mph}}{10 \text{ mph}}\right\} \frac{3}{5} = 50 \text{ ch/hr}$$

(d) Fuel Moisture (See Graph 4)

$$\left\{\frac{\text{Spread Step (d)}}{\text{Predicted Spread}}\right\} \frac{50}{X} :: \left\{\frac{5.5\%}{3\%}\right\} \frac{20}{32} = 80 \text{ ch/hr}$$

80 chains per hour is the predicted rate of spread after adjusting past observed rate of spread for predicted conditions of fuel type, slope, wind, and fuel moisture.

NUMBER OF MEN TO CONSTRUCT 100 CHAINS OF LINE IN
SPECIFIED HOURS, BY FUEL TYPES

Fuel Type	Basic Rate Chains per Man Hour	Number of Men Required to Construct 100 Chains of Line in							
		1	2	3	4	5	6	7	8 Hours
1	4.0	25	14	10	9	8	7	6	6
2	3.6	28	16	12	9	8	7	7	7
3	4.7	21	12	9	7	6	6	5	5
4	3.7	27	15	11	9	8	7	7	6
5	2.7	37	21	15	13	11	10	9	9
6	1.4	71	41	30	24	21	19	18	17
7	2.7	37	21	15	13	11	10	9	9
8	1.4	71	41	30	24	21	19	18	17
9	1.2	83	48	35	28	25	22	21	20
10	1.1	91	52	38	31	27	24	23	22
11	.7	143	82	59	48	42	38	36	34
12	.7	143	82	59	48	42	38	36	34
13	.4	250	143	104	84	74	66	63	60
14	.3	333	190	139	113	98	88	84	80
15	.5	200	114	83	68	59	53	50	48
16	1.2	83	48	35	28	25	22	21	20
17	6.2	16	9	7	6	5	4	4	4

See Photos for illustrations of types and descriptions.
Allowance made for periodic rest periods and cumulative fatigue factor.
See R. 5 F.C. Handbook, Page 87, and chart on insert between Pages 87 and 88 (Part III).

NUMBER OF MEN TO HOLD LINE CONSTRUCTED AT RATE OF
10 CHAINS PER HOUR, BY FUEL TYPES

Fuel Type	Hours Line Must be Held	Number of Men Required to Hold Line Constructed at the Rate of 10 Chains for Given Hours of Construction.*				
		1	2	3	4	5, 6,7& 8 Hours of Construction
1	0	0	0	0	0	0
2	1/2	1	1	1	1	1
3	1-1/2	1	2	2	2	2
4	1	2	2	2	2	2
5	3	4	8	12	12	12
6	3	3	6	9	9	9
7	1/2	1	1	1	1	1
8	1/2	1	1	1	1	1
9	4	8	16	24	32	32
10	1	3	3	3	3	3
11	4	6	12	18	24	24
12	1	3	3	3	3	3
13	4	8	16	24	32	32
14	4	10	20	30	40	40
15	4	8	16	24	32	32
16	4	8	16	24	32	32
17	1	1	1	1	1	1

*If line is constructed at rate of 20 chains per hour, multiply above values by 2, if rate of construction is 50 multiply above values by 5, etc.

Example: The available workers on a fire in Type 5 build line for 4 hours at the rate of 100 chains per hour. In above table opposite Type 5 and under 4 hours of construction, read 12 men. Therefore, it will take 10 x 12 men or 120 men to hold the line constructed in 4 hours at the rate of 100 chains per hour.

IV

FIRE ORGANIZATION

ORGANIZATION FOR LARGE FIRE SUPPRESSION

For a detailed write-up of fire organization refer to "Principles of Organization for Forest Fire Suppression, 1953." The following are "musts" of good organization:

1. Organization for a particular situation should conform to the pattern required by the situation at hand. Fulfillment of all functions on organzation chart are necessary on every fire. Positions are to be filled only as needed.

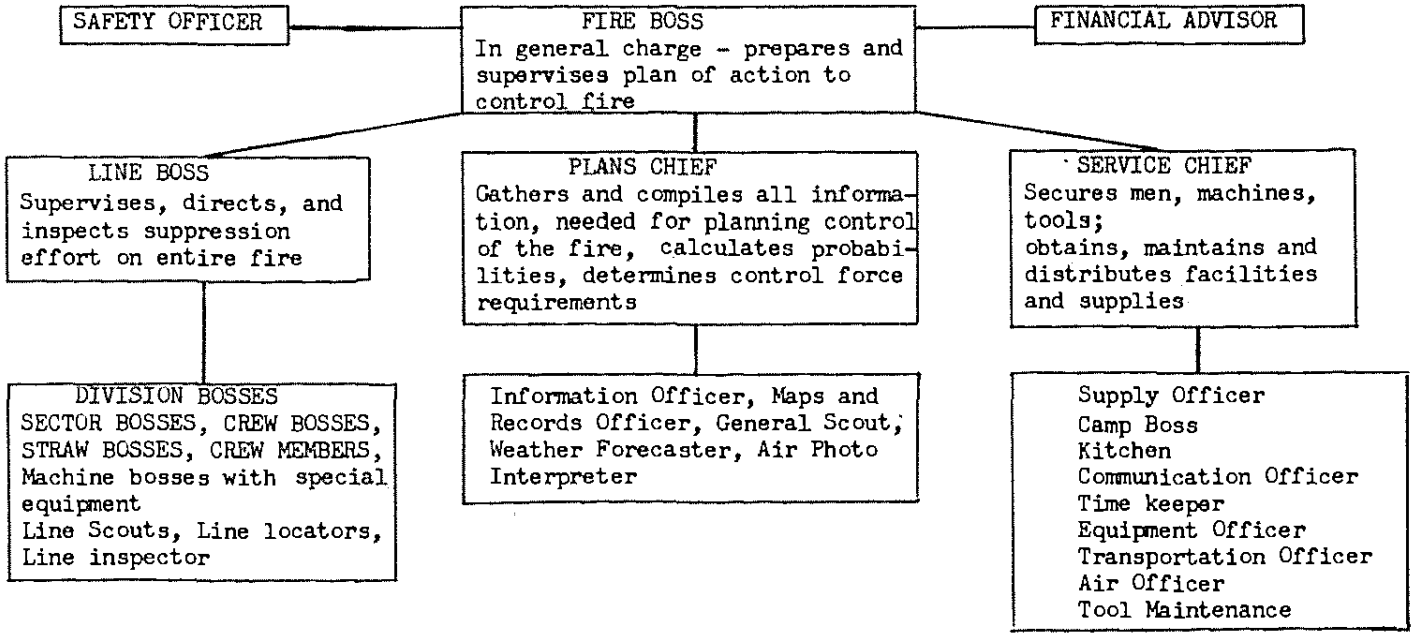
2. Duties of a vacant position must be absorbed by the chief of the group concerned and not by combination of jobs or by assignment to another group. Chain of command follows the solid lines shown on the chart.

3. Each individual must learn and adhere to the job description covering his assigned position. Do the job assigned competently, don't try to be the Fire Boss. Supervisory personnel must be familiar with the jobs they are supervising and see that assignments are within the scope of position job descriptions.

4. Fire Boss, Plans Chief and Service Chief positions must be filled with fully qualified men. No replacement or relief for these positions. Supply adequate staff assistance soon enough to permit these men to obtain their rest. Don't hesitate about replacing men if the job gets too big for their capabilities.

5. Where deviations from the organization pattern is unavoidable, cover the deviation with concise written instruction to each individual affected by the deviation. This is a last resort measure and something to be avoided.

ORGANIZATION - LARGE FIRE



JOB DESCRIPTION - FIRE BOSS

The Fire Boss has full authority and responsibility for managing a fire control operation within the framework of legal statute and current policy statements.

His primary responsibility is to organize and direct the fire organization toward efficient and complete control of the fire:

Responsibilities during early stages of the fire:

Prior to leaving for the fire, he must obtain the best available information on the location of fire and forces and equipment being sent.

On larger and more complex fires he will usually travel to the fire by a route that will provide a vantage point to size-up the fire and the adjacent country. Where feasible when complex fires are involved he will make this observation from an aircraft.

Upon arrival at the fire he will:

Determine probable spread by immediate time periods on small simple fires and probably spread during first burning period on the more complex fires.

Next he will notify the dispatching agency of the adequacy of resources assigned to the fire with an estimate of what the fire may do and what further resources are required for control.

Prepare a plan of control which will insure the most effective and safe use of assigned resources.

Provide positive safe measures to insure proper disposition of resources upon their arrival at the fire.

Organize resources presently working on the fire in keeping with his plan of control.

Actively direct and coordinate the activities of fire suppression for the balance of the shift or until control is effected giving consideration to unsafe and dangerous developments. See that demobilization plans are prepared.

Report changes in conditions unless to do so will interfere with his line supervision duties.

Maintains a communication schedule (by assignment of an individual to this job if personal contact interferes with line supervision).

Prior to crew or sector organization, will assume all the responsibilities of the Crew or Sector Boss.

Organize the line forces into crews, sectors and divisions when required.

Organize needed Service and Plans Units.

Responsibilities of the Fire Boss on the going fire:

Determine strategy and tactical plan for control and issue necessary orders to obtain needed manpower, overhead, equipment and facilitating gear.

Decide on use of off-shift personnel or other available personnel to meet unforeseen or new situations.

Brief Line Boss, Plans Chief and Service Chief where employed. (Crew, Sector and Division Bosses are briefed and interrogated by the Fire Boss on fires where they operate under his immediate direction.)

Conduct strategy meetings when appropriate.

Check on and initiate action to provide for the welfare and safety of all personnel.

Maintain high level of performance.

Take required action on all cases of personnel deficiency.

Anticipate need for and assign work to functional assistants as needed. Prior to their arrival, must perform the duties of all vacant positions in the direct channel of command.

Determine need for Safety Officer.

See that functional assistants when used understand and complete their work thoroughly and within time limits in accordance with plans.

Remain in communication, for emergency consultation except for short periods. Designate an acting Fire Boss with full authority for decision when necessary.

By proper planning and delegation secure sufficient rest. See that subordinates secure all possible rest.

Visit critical and potential problem areas personally.

Determine time when demobilization should start. On fires with a heavy fire job load this involves demobilization of Plans, Service and Line functions.

Make out performance rating for immediate subordinates.

JOB DESCRIPTION - SAFETY OFFICER

A Safety Officer is usually employed on all Multiple Division and fires requiring a large fire organization. The need for a Safety Officer on less complex fires will depend upon the experience of personnel used and hazardous conditions involved such as rough terrain, snag area, etc. Ordinarily, the Fire Safety Officer should be a responsible forest officer from the home forest, appointed by the Forest Supervisor of the Forest on which the fire occurs. He will be responsible directly to the Fire Boss. He must have fire experience and a thorough knowledge of fire safety hazards and how they are removed.

The Safety Officer shall keep the Fire Boss currently informed of any action needed to prevent accidents. He is essentially a safety inspector and investigator. He is expected to give safety advice to everybody in the fire organization. The Safety Officer should at all times appreciate the Fire Boss' responsibility with respect to the suppression of the fire and as a Safety Officer he should direct the safety work in such a manner that his actions contribute rather than slow down suppression action.

Some of his most important duties are:

Surveys major hazards in connection with fire line, fire camp, transportation of men, and other fire activities and makes recommendations on how to remove or reduce the hazards.

Checks and reports on availability of facilities to handle minor injuries, and arrangements to take care of serious cases (doctors, ambulances, hospital rescue services, Red Cross Disaster units).

Checks and reports on compliance with Forest Service Safety Code, and use of preventive equipment such as safety guards and hard hats.

Checks and reports on laborers physically unfit for their jobs.

Checks and reports on welfare, sanitation, and safe drinking water conditions. Checks on kitchen personnel, conditions, food, etc.

Checks accident reports and investigates and reports upon serious cases.

Arranges for emergency first aid as necessary.

On fires of several days' duration maintains safety bulletin board and distributes safety materials.

Provides safety advice in strategy planning.

Organizes when possible and aids and advises with overhead in on-the-ground safety training.

This position does not relieve the Service Chief or Camp Boss of the responsibility for having adequate first aid facilities in camps and on the line, operating first aid stations for treatment of minor injuries, arranging for treatment of more serious cases by regular physician, preparing necessary forms, etc. Neither does the position undercut or affect in any way the safety authority and responsibility of any line officer. Such line officers should freely confer with the Safety Officer on special problems that might arise.

One important function of the Safety Officer, as well as all Forest Officers, is to foster the right attitudes about fire fighting. Fires can be dangerous and Forest Officers must respect the aggravated hazards in fire control. The Fire Safety Officer as well as other overhead can instill confidence in fire fighters by letting them know that their welfare is the first consideration when laying out the attack plan for the fire operation.

Safety is within our reach and needs only to be practiced to be realized.

Note: Usually employed on Multiple Division and fires requiring a large fire organization.

JOB DESCRIPTION - FINANCIAL ADVISOR

JOB DESCRIPTION - PLANS CHIEF

Works under the supervision of the Fire Boss.

Is responsible for:

1. Collecting and compiling all data concerning the fire, calculating probabilities and control force requirements.

2. Collecting and compiling data on resources assigned to the fire.

3. On the basis of Fire Boss decisions and instructions preparing individual written instructions for line personnel to Sector Boss level.

4. Maintaining all records for the fire, both management and administrative. Such records to include the log of the fire, time records, data for preparation of 929, 10 o'clock report, special narrative report, summary of personnel and special equipment.

5. Assignment of personnel, equipment and tools to line units as specified by the Fire Boss or on his own initiative where instructions are lacking.

Specific duties of the position are:

1. Obtain and compile in usable form the following data concerning the fire area:

   a. Location of fire perimeter
   b. Behavior of fire on all parts
   c. Topography
   d. Soil formations
   e. Cover (types and density)
   f. Weather conditions, current and forecasted
   g. Access routes and rate of travel
   h. Status of control
   i. Possible camp sites

2. Calculate probabilities of the fire.

3. Calculate control force requirements and determine type of action most applicable within the limits of available resources.

4. Prepare a statement of communication requirements for the line and planning units indicating frequency of contact and priority of installation.

5. Maintain a record of manpower, overhead and special equipment showing:

   a. Number
   b. Qualifications
   c. Identification
   d. Location (on-shift, off-shift and where located)
   e. Time in a work status

6. Prepare written instructions to line personnel on basis of Fire Boss decisions and instructions. Instructions to include:

   a. Section of line assigned to each unit.
   b. Time allowed for completion of control.
   c. General action plan.
   d. Pertinent information concerning adjacent divisions.
   e. Alternate plan of control and steps required to place in effect.
   f. Location of camps, radios and other service facilities.
   g. Map of fire or at least of assigned unit of fire.
   h. Special explanation as needed for understanding of assignment.

7. Assist Fire Boss in briefing of line personnel.

8. Prepare or collect information for all administrative reports such as 929, special narrative, 10 o'clock.

9. Plan personnel needs of the Plans Unit. Organize them and supervise their work. Prepare specific written instruction for these men as necessary.

JOB DESCRIPTION - MAPS AND RECORDS OFFICER

Is responsible to the Plans Chief for collecting and compiling all data on resources available for control of the fire, performing all clerical duties in connection with instruction preparation, etc., preparation of all administrative records in connection with control of the fire. Should use to the fullest extent possible the records of others but will initiate such action as is necessary to secure a complete set.

Specific duties are:

1. Acquaint all personnel as they arrive in camp of camp routines (reference to bulletin board) and layout of camp.

2. Prepare written instructions on the basis of rough draft or verbal instructions.

3. Prepare shift organization map showing disposition of resources. Cross-reference to job instructions and organization charts.

4. Collect and summarize records of communication officer, transportation officer and supply officer immediately prior to each planning session.

5. Prepares a chronology of fire action currently, appends copies of maps prepared by the intelligence officer showing perimeter of fire and status of control by 12-hour periods.

6. Prepares a "Summary of the Situation" similar to 10 o'clock report each 12-hour period.

7. Assembles all regular administrative reports concerning the fires.

8. Determine personnel and equipment needs for the records unit.

9. Organizes and supervises subordinate personnel.

JOB DESCRIPTION - INFORMATION OFFICER

Is responsible to the Plans Chief for gathering all information concerning the fire area. Such information to cover all points on the Scout reminder list plus any specific information requested by the Plans Chief. Information to be in the form needed for intelligent analysis and within time limits established for the particular fire. Will determine the requirements of his organization including personnel, facilities, and service and provide the necessary supervision and guidance to insure adequate performance.

Representative Functions

1. Establish and designate key points on line and sign access routes into such points. Prepare map showing this data.

2. Determine method of scouting and/or line inspection (foot, horse, plane, car).

3. Place order for needed transportation for himself and subordinates.

4. Determine size of scouting and/or line inspection job and divides fire area into scouting units.

5. Assigns personnel to complete the job in time allotted.

6. Prepares and issues instructions to Scouts and Line Inspectors. Instructions to include:
   a. Area assigned.
   b. Data to obtain. (See Scout Reminder List.)
   c. Method for recording.
   d. Time and method of communicating data.

7. Secures and assigns necessary facilities for doing Scout or Line Inspector job (compass, abney, rule, protractor, map sheets, photos).

8. Receives all Scout and/or Line Inspector reports direct. Records data on master scout record. Such record to show location, character, time of observation and magnitude of findings. Will include current accomplishments and anticipated accomplishments by end of current shift.

9. On controlled lines, map of line showing location of special hazards.

10. Map of areas needing special spot fire attention.

11. Scouts personally where time and size of job permit and in any event sufficiently to permit intelligent analysis of scout reports.

12. Makes contact with line personnel and secure their opinion on:
    a. Manpower requirements next shift.
    b. Tools and special equipment next shift.
    c. Problems needing special attention.
    d. Best point for distribution of next shift and point for pickup of present shift.

13. Locates possible camp sites and prepares map of access route.

14. Locates and maps unburned islands.

15. Secures data on construction rates.

16. Prepares map of fire by 6-hour periods.

17. Secures data on values, houses, fences, etc., that may affect control plan.

18. Prepares photo maps of fire area showing perimeter and other pertinent information such as roads, streams, ridges, spot fires.

JOB DESCRIPTION - GENERAL SCOUT

Is responsible to the Information Officer (or Fire Boss, if no Information Officer). Used primarily for serial scouting alternating with Information Officer. Does ground scouting when planes or helicopter unavailable, or when heavy timber, smoke, fog or topography make aerial scouting unsatisfactory. Person assigned to general scouting job should be whenever possible a local forest officer or a native trained in scouting and familiar with the area.

Duties:

Receives assignment and reviews plan with immediate superior.

Takes flight over fire area, if possible, before scouting on the ground.

Studies aerial photos, topographic maps and administrative maps before going to fire. Secures data from serial photo interpreters when employed.

Gets as much information as possible regarding area to be scouted from local residents, local forest officers, Line Scouts and line men already on the fire.

Determines mode of communication and agrees with immediate superior on communication schedule.

Agrees with immediate superior on coordinate system of reporting map locations.

Uses horse or pickup for transportation whenever possible and covers balance of area on foot.

Scouts ahead of control crews securing, recording, mapping and reporting as scheduled to his immediate superior:

Location and behavior of fire edge, hot spots, etc., whether smoldering, creeping, running or crowning.

Location, size, behavior, and potentialities of spot fires.

Fuel types, understory or ground fuels, and hazards such as snag areas, slash areas, etc., in adjacent to and ahead of main fire and spot fires.

Any improvements such as building, power and telephone lines, bridges, etc., threatened or destroyed by the fire.

Weather conditions encountered on ridges, slopes, canyon bottoms, etc., such as wind, temperature, humidity and moisture condition of fuels whether wet, damp, dry, etc.

Indicate whether streams can be crossed on foot or by tractor.

Location of any features not shown on maps, such as trails, roads, streams, springs, etc.

Location of possible camp sites, aerial drop areas, helicopter landing spots, etc.

Location of ridges or other likely control lines, showing steepness of slope, cover, soil condition, etc., indicating whether there are any barriers to tractors such as rocks, steep areas, etc.

Location of streams, canyons, ravines, etc., possible for control lines. Indicate if canyons are too narrow and steep to be used for control lines.

Indicate any special equipment needs.

Possible routes to various parts of fire edge or spot fires.

Possible escape routes or safety areas for crews, if needed.

Report location of crews or "cats" encountered, progress of line construction, held line, controlled line, etc.

Report immediately:

Any condition needing immediate attention such as fire endangering a crew, buildings, bridges, power or communication lines or threatening to cut off routes of travel or trap travelers on highways, roads, etc.

Any threat or condition which might be remedied through immediate attention and prevent excessive work later such as spot fires away ahead of main burn, a hot spot threatening to cross a road or get into a snag area, slash area, etc.

In extremely rough or hazardous country, scouts should work in pairs.

Note: Employed only as needed. When Plans Chief is employed he is responsible to him, otherwise the Fire Boss.

JOB DESCRIPTION - AERIAL PHOTO INTERPRETER

Is skilled in aerial photo interpretation and puts aerial photos to their fullest use in fire control activities. Responsible to the Information Officer and works with the Fire Boss, Plans Chief, and assists General Scout and Records Officer in obtaining information from air-photos, which they might overlook or be unable to interpret themselves. May also perform duties of the General Scout, if qualified.

Duties:

Sees that adequate aerial photos are obtained to cover fire area and area which probably will be burned, based on predictions of Fire Boss or Plans Chief.

If not enough sets of aerial photos available, makes recommendation to immediate superior on number of sets needed and where available.

Obtains as much information as possible from aerial photos to eliminate the necessity of much ground scouting. Obtains, records, and maps such information as:

Cover type, fuel density and hazards such as snag and slash areas.

Improvements threatened, or in the path of the fire, such as building, power and telephone lines and bridges.

Location of natural barriers such as, rock slides, streams and bare areas which might be used as control lines.

Location of ridges or other likely control lines, showing steepness of slope, cover, soil conditions, indicating whether there are barriers to tractors such as steep slopes and rocks.

Location of canyons and ravines possible for control lines or indicate if canyons or ravines are too steep or narrow to be used for control lines.

Location of features not shown on available maps, such as trails, roads, streams, springs, reservoirs.

Location of possible camp sites, aerial drop areas, helicopter landing spots.

Easiest possible routes or safety areas for crews.

Location of secondary control line and backfire lines.

In absence of General Scout accurately plots location of fire edge, spot fires and unburned islands from the air. If planes are not available, scouts and plots from the ground.

Assists Records Officer in preparing simple maps from aerial photos for use on the fire.

Aids in briefing line personnel on cross country routes to their part of the line, especially when existing maps are in error.

After fire is over, may be able to assist in making damage appraisal estimates, such as burned area - burned timber, brush, grass and woodland.

Note: Employ only as urgently needed.

JOB DESCRIPTION - ZONE BOSS

JOB DESCRIPTION - LINE BOSS

When a fire organization reaches a stage making it impossible for the Fire Boss to devote sufficient time to the supervision and direction of Sector or Division Bosses a Line Boss is required whose primary responsibility is to see that the line plan of the Fire Boss is carried out. He and his line overhead have but one responsibility; this is to direct field action to control the fire in accordance with the strategic and broad tactical plan of the Fire Boss and to see that the work is accomplished with safety. He is provided with a job assignment which specifies the general location, time of completion and, in general terms, the nature of the work to be accomplished. He is informed of control forces (men, tools, specialized equipment and overhead in organized units) and adequate transportation, communication, and camp facilities available. He has latitude to make decisions within the limits of the plan given him.

He is directly responsible to the Fire Boss.

He:

Organizes field forces on his assigned units of the fire in accordance with the plan of control provided by the Fire Boss.

Adheres to the following units of authority and responsibility and performs the duties as indicated by the following representative list:

Reviews the plan of control pertaining to his area with the Fire Boss making such suggestions as he feels pertinent on the basis of personal knowledge of the fire and requesting such adiitional information as is necessary to adequate performance of his duties.

Briefs his line overhead for the ensuing shift. Checks each to make sure all points are fully understood. Such instruction to include:

Condition of fire behavior and fuel peculiar to locale. Particular note of blow-up possibilities.

Location of work including alternate plan, and division termini. If there are several divisions, location of sector termini should be handled by the Division Bosses. Sequence and timing of operation.

Whereabouts and means for his immediate line overhead to contact him during the shift.

Resources assigned and planned organization of the division - on sectors when serving as Line Boss on fires below the Division Stage.

Will keep currently informed of conditions and progress on divisions or sectors assigned him, personally inspecting the more important ones at least once each shift. Inspection will cover the following points in the Line Boss check list:

Is action being taken in accordance with time limits specified in control plan?

Are proper techniques being employed?

Are resources adequate (number, type and condition) for the assigned job?

Does manpower and specialized equipment complement each other?

Are sectors or division properly correlated ?

Are plans and services adequate?

Are special problems that will carry over to the next shift located, identified and recorded for transmission to the Plans group upon request and for review with personnel of the relief shift.

Are Sector Bosses receiving guidance and training from Division Bosses?

Are surplus resources being made available for redistribution or release?

Are inter-sector and inter-division resources (such as plows, and bulldozers) being properly shared?

Are strategic and general action plans being followed?

Coordinates activities of all sectors of divisions in his charge and determines need for immediate redistribution of resources to meet conditions as they develop and, if possible, calls them to the attention of the Fire Boss. If need for redistribution is urgent and communication impossible, makes adjustment and notifies Fire Boss at earliest possible moment.

Determines the disposition of planned reserves, calling into action as needed without further clearance. Should if possible, notify Fire Boss of action.

Will coordinate activities of Sector Boss on the Three Section fire or Division Bosses on other fires by radio, written message or personal interview to keep them assured as to the correctness of action being taken by them.

Participates in reduction in size of overhead organization when the job requirements permit combining of duties.

Will see that subordinates (Division Boss-Sector Boss-Crew Boss) adequately handle timekeeping responsibilities.

Makes out performance ratings of immediate subordinates when required.

True safety is within our reach and needs only to be practiced to be realized.

Note: Line Bosses are used when required; but usually never below the Three Sector Stage fire.

JOB DESCRIPTION - DIVISION BOSS

The Division Boss is usually responsible to the Line Boss. His direct responsibility is the control of a designated division of a fire, including all phases of line work, backfiring, mop-up and patrol. He has full authority and responsibility for directing and supervising all work on his division.

The span of control is 3 to 4 sectors. He should be able to cover the hot or troublesome sections of the fire line or fire edge at a minimum of two times per shift using all available modes of transportation and considerable walking.

This rule may be limited to one trip if critical sections demand his presence and the remainder of the sectors are under reasonable control. He pays special attention to potential blow-up conditions, line of retreat for crews and safety areas.

He should not leave his division unless approved by his superior until he has thoroughly reviewed the conditions, problems and accomplishments with the Division Boss of the next shift.

He:

Organizes field forces on his division of the fire in accordance with the plan of control provided by the Line Boss, in some cases by the Fire Boss.

Adheres to the following units of authority and responsibility and performs the duties as indicated by the following representative list:

Reviews the plan of control pertaining to his area with the Line Boss making such suggestions as he feels pertinent on the basis of personal knowledge of the fire and requesting such additional information as is necessary to adequate performance of his duties.

Briefs his line overhead for the ensuing shift. Checks each to make sure all points are fully understood. Such instructions to include:

Condition of fire behavior and fuel peculiar to locale. Particular note of blow-up possibilities.

Location of work including alternate plan. Sector and Division termini. Sequence and timing of operation.

Whereabouts and means for his immediate line overhead to contact him during the shift.

Resources assigned and planned organization of the Division and sectors.

Will keep currently informed of conditions and progress on his division and adjacent divisions. Will personnlly inspect work on "hot" or troublesome sectors twice each shift. Inspection will cover the following points in the Division Boss check list:

Is action being taken in accordance with time limits specified in control plan?

Are proper techniques being employed?

Are resources adequate (number, type and condition) for the assigned job?

Does manpower and specialized equipment complement each other?

Are sectors properly correlated?

Are plans and services adequate?

Are special problems that will carry over to the next shift located, identified and recorded for transmission to the Plans group upon request and for review with personnel of the relief shift.

Are Crew Bosses receiving guidance and training from Sector Bosses?

Are surplus resources made available for redistribution or release?

Are inter-sector resources (such as plows, and bulldozers) being properly shared?

Are strategic and general action plans being followed?

Coordinates activities of all sectors in his charge and determines need for immediate redistribution of resources to meet conditions as they develop and, if possible, calls them to the attention of the Line Boss. If need for redistribution is urgent and communication impossible, makes adjustment and notifies Line Boss at earliest possible moment.

Determines the disposition of planned reserves, calling into action as needed without further clearance. Should if possible, notify Line Boss of action.

Will coordinate activities of Sector Bosses on his division by radio, written message or personal interview to keep them assured as to the correctness of action being taken by them.

Participates in reduction in size of overhead organization on his division when the job requirements permit combining of duties.

Will see that subordinates (Sector Boss-Crew Boss) adequately handle timekeeping responsibilities.

Makes out performance ratings of immediate subordinates when required.

True safety is within our reach and needs only to be practiced to be realized.

Note: Division Bosses are usually used on all fires requiring 3 or more sectors.

JOB DESCRIPTION - SECTOR BOSS

Sets in motion and supervises the operations called for in the general action plan for his sector as outlined by Division Boss or Line Boss. Attains the rates of progress and the quality of performance necessary for suppression of the fire. Determines specifically the time for starting and completing individual operations on his unit. Guides, coaches, and assists Crew Bosses or Sector Specialists as necessary to secure the quality and quantity of work required. Remains on his sector until specifically relieved.

Will assign specific functions or section of line to Crew Bosses or Machine Bosses. In making assignments will:

1. Describe or point out, where possible, the location of the work.

2. Define the standard of performance, i.e:
   a. Width of line or area to be worked.
   b. Time to start the operation.
   c. Time to complete the operation.

3. Define techniques to be employed where doubt exists as to ability of subordinate.

4. Explain the organization on the sector.

5. Describe special problems of the unit and define how they shall be handled.

6. Assist in organization of the crews to accomplish the job most expeditiously.

7. Specify arrangements for service facilities.

8. Specify arrangements for relief.

9. Specify safety precautions including line of retreat and treatment of injuries.

10. Specify location of and use of communication facilities.

11. Review off-shift responsibilities, time report, messing, sleeping, first aid, commissary. After assignment of personnel,will devote his energies to supervision of the Crew Bosses and their work. Inspection of work, training of Crew Bosses, assistant to Crew Bosses on unfamiliar activites and line location in advance of construction will be his major responsibilities.

Keeps Division Boss informed by radio or messenger, of progress on his Sector as per schedule. Anticipates problems requiring a change of the general action plan or assistance of the Division Boss in solving and discusses these with the Division Boss. Calls attention of Division Boss to surplus or shortage of resources as soon as these become evident.

May not make a shift in resources or change the strategy or general action plan of the sector without approval of the Division Boss except:

a. Where action of the fire forces abandonment of a portion of the line or requires unanticipated action such as control of a break-over or spot fire which cannot be handled as an individual problem and

b. The Division Boss, Line Boss, Plans Chief or Fire Boss cannot be reached within allowable time limits for decision and

c. That such action does not jeopardize the safety of personnel or invalidate the action of adjacent Sectors.

Will remain on his Sector until relieved by replacement or by specific instruction of the Division Boss. When relieved will account for all the resources assigned his Sector as to location and general condition prior to actual departure from the Sector.

JOB DESCRIPTION - CREW BOSS

The Crew Boss works under the supervision of the Sector Boss or his assistant. He is responsible for the performance of his crew, their safety and their welfare for the duration of their assignment to him. Will retain the same crew for the duration of the fire; hence has responsibility for them both on the line and off the line. Will remain on line until instructed by his superior officer to leave.

"On-the-line" duties consist of:

1. Explaining at the beginning of each shift:

   a. The nature of work to be accomplished.
   b. Expected duration of the shift.
   c. Chain of command - who issues instruction.

2. Organizing the crew to efficiently accomplish specific tasks.

3. Locating and assigning individual tasks to Straw Bosses or crew members within the assigned section of line.

4. Explaining and/or demonstrating techniques of accomplishing the tasks safely and efficiently where crew members are inexperienced or unskilled, i.e., provide current on-the-job training to insure acceptable performance.

5. Stimulating Straw Bosses and crew members to attain quality and quantity accomplishment.

6. Providing first aid treatment for minor injuries.

7. Inspecting the area assigned frequently to assure accomplishment of required standards of performance.

"Off-the-line" duties consist of:

1. Retaining his crew as a unit, keeping them so mobilized as to answer to any request with his crew intact at any time.

2. Inspect physical condition, clothing and equipment of crew members prior to leaving and immediately after arrival at service base each shift. Take such action as indicated to maintain crew in usable condition.

3. Prepare and maintain time report in duplicate showing:

   a. Name of crew members.
   b. Time slip number.
   c. Origin of crew (lumber company, Sact. P.U., Deerhill road crew, etc.)
   d. Hours on duty.
   e. Pay classification. Turn in copy to Records Officer. Copy at beginning of shift - original at end of shift.

4. Supervise crew while being transported between fire line and service base.

5. Learn (from Bulletin Board or Registrar)layout and routine of camp (feeding, sleeping, commissary, sanitation, etc.). Instruct crew members and keep them under control.

JOB DESCRIPTION - STRAW BOSS

Works under supervision of Crew Boss as a working leader of a small group, usually not more than six men. Is responsible for keeping men fully employed on jobs assigned to his direction by Crew Boss.

Duties:

Understands exactly what the Crew Boss wants done.

Sees that crew has first aid kits, hard-hats, files, etc., before leaving camp.

Sees that men do a reasonable day's work.

Sees that no effort is wasted on unnecessary work.

Keeps men well equipped with proper tools.

Shows men how tc use and care for tools.

Helps Crew Boss in off-the-line and camp duties.

Assists the Crew Boss in checking men out and in with the timekeeper.

Keeps a list of names of men and keeps time if requested by Crew Boss.

Looks after the safety of the men on the line.

Reports lazy and incompetent men and agitators to the Crew Boss.

Observes and enforces smoking rules.

Looks after safety of men during transportation.

Sees that the men have lunches and water.

True safety is within our reach and needs only to be practiced to be to be realized.

Note: Straw Bosses are used on all fires requiring more than 6 line workers.

JOB DESCRIPTION - LINE SCOUT

Is responsible to the Officer to whom assigned, either the Fire Boss, Line Boss, Division Boss, or Sector Boss, when conditions are such that the Line Officer or Fire Boss cannot do advance scouting for his unit without detriment to his other responsibilities. Used primarily on the complex project stage fires when heavy timber, smoke or topography limit the gathering of information to arduous foot travel, consequently limiting Plans activities. Obtains full detailed information on location, condition, progress, behavior, and safety within and adjacent to his territorial assignment from or through the Plans Chief and line officer.

Duties:

Secures available information and maps from Plans Chief before going to the fire.

Determines mode of communication and agrees with line officer on communication schedule.

Reviews coordinate system of reporting map locations.

Goes to designated area ahead of control crews, marks route with rags or blazes as necessary. If acquainted with area, may guide crews to area.

Scouts ahead of control crews securing, recording and reporting currently:

Location and behavior of fire edge within assigned area - hot-spots, etc.

Location, size, behavior and potentialities of spot fires.

Fuel types and hazards in and adjacent to fire edge and spot fires.

Possible escape routes and safety areas for crews, if needed.

Possible routes to various parts of fire edge and spot fires.

Water chances enroute.

Areas in which tractors, trenchers, or plows can be used.

Special small equipment needs.

Prevailing winds - slopes.

Upon request of immediate superior:

Acts as Line Locator ahead of crews.

Marks route to spot fires.

Directs small crews to spot fires.

Maintains contact with adjoining units.

Knows Line Locator's job description.

Note: Use only when needed. This position on Division Stage Fires is usually attached to the Division with assignment to sectors where services are needed.

JOB DESCRIPTION - LINE LOCATOR

A Line Locator is needed when fuel, topography and visibility conditions are such that tractor or hand crew line production is held up because of lack of advance fire edge or ground information.

He works under the direct supervision of and is responsible to the Sector Boss for on-the-ground location of the fire line to be built. It is important that the Line Locator be thoroughly familiar with:

Fire behavior and line location techniques.
What can be expected of the various kinds of equipment.
What can be expected of those for whom he is locating.

Specifically, his duties are:

Familiarizing himself with the general plan of control on the sector or sectors to be worked. Notifies Sector Boss when end of sector is reached so Fire Boss, Line Boss, or Division Boss can be informed.

Locating and marking route to be followed far enough in advance of operation so that if changes are necessary, they can be made before the crews reach the questionable location.

Selecting tractor-dozer or plow line locations that can be traversed by the machine and will avoid:

Wet or soft ground.
Solid rock or extremely rocky ground.
Heavy snag and down log areas.

Contouring on steep slopes.

Slopes requiring a climbing excess of that which can be negotiated by the unit being used.

Loose boulders on brushy slopes.

Keeping the Sector Boss on whose sector he is working currently informed of the progress he has made - difficulties to be encountered, etc.

General Rules:

Locates line as close to fire edge as possible consistent with burning conditions and strategy outlined by Sector Boss.

Avoids snag patches and heavy down log or slash areas if possible. Keeps these hazards outside of the area to be burned out.

Chooses route to make line construction as easy and rapid as possible, taking advantage of openings, bare areas, barriers, roads, trails, etc.

Avoids as much undercut line as possible and locates line so rolling material will not cross.

Avoids fingered line if possible.

Avoids sharp angles in line.

Locates line a sufficient distance from fire edge so it can be constructed and burned out before main fire reaches it. Takes into consideration fatigue factor of hand crews.

Locates line far enough from burning snags to catch most of sparks and to contain snag if it falls or is felled.

Takes advantage of normal daily shift between up-and-down canyon drafts.

Note: Use only when needed. This position on Division Stage Fires is usually attached to the Division with assignment by the Division Boss to sectors where the need makes his service necessary.

JOB DESCRIPTION - CAT BOSS

He is responsible to the Fire Boss on Multiple Crew or smaller fires and to the Sector Boss on all other fires for the efficient use of dozers and plows on the fire. Based on instructions from his Fire Boss or Sector Boss, he will:

Construct the fire line as determined by his administrative superior.

Supervise and correlate the work of the dozers and plows and personnel assigned to his operation.

Provide for the safety and welfare of equipment and personnel assigned to him.

Keep time for all machinery and personnel under his supervision; check it with operators and submit to timekeeper.

Develop an on-the-spot understanding between the dozer (plow) operators and the dozer (plow) crews of the signals to be used in directing the operators. They should include such commands as "stop", "come ahead", "back up", "caution", "cannot see spotter", "turn left", "turn right".

Arrange with immediate superior for relief of operators and other members of his crew or crews.

Make arrangements with Equipment Officer for the proper servicing and maintenance of the machines (fuel, lubrication) with a minimum loss of time.

Inform immediate superior immediately of any breakdowns. Likewise inform him of progress being made and when the job is finished. Avoid long and unnecessary idleness of equipment. (It may be urgently needed elsewhere.)

Be alert to the following good management practices when using dozer equipment:

When working close to the fire avoid carrying fire outside the line. Hot burning logs and stumps should be pushed into the burn away from the line.

Do not allow operator to bury fire or leave "dozer piles" within the burned area. Scatter or remove them as they may hold fire for weeks and cause the eventual loss of the fire.

Take advantage of favorable fuels and topography.

Keep men away from the vicinity of the tractor or plow.

Advise all members of his crews of the hazards of the job and have adequate plans of escape to be used in event of a blow up.

When two or more dozers or plows are used as a unit or worked in tandem, see to it that they work far enough apart for safe operation. Likewise, that they do not become so widely separated that they cannot be communicated with.

Long sustained grades on the fire line should be broken in order to avoid excessive erosion.

Personally supervise loading and unloading of tractors and other heavy machinery when possible.

Will report completion of assigned job to immediate superior.

True safety is within our reach and needs only to be practiced to be realized.

Note. Use only when needed.

JOB DESCRIPTION-POWER SAW BOSS

The Power Saw Boss works under the supervision of the Fire Boss on all fires below the Sector Stage, under the Sector Boss on all other fires and is responsible for the work of the men and equipment assigned to him. This is a highly specialized field requiring the services of a man who is not only familiar with fire control requirements but is well versed in the mechanical operation of power saws and the job of felling timber. The work may consist of partial cutting of logs in front of a tractor, cutting logs for hand or plow line construction, felling snags prior to burning operations or in mop-up operations.

Specifically his duties are:

Familiarizing himself with the basic plan of control on his assigned sector or sectors.

Coordinating the falling operations of his crew or crews with the work of other crews and machines to avoid endangering these facilities and unnecessary delays.

Upon advice from his immediate superior determining the priority of work, selecting snags or snag area most dangerous to control for immediate removal, width of strip to be worked, etc.

Supervising and coordinating the work of the falling crews assigned to him.

Reporting currently to his immediate superior, keeping him informed of progress.

Seeing that arrangements are made for the shifting or release of saw crews no longer needed in the operation.

Knowing the safety requirements necessary and see that saw crews adhere to same.

Keeping correct time reports for fallers' time and power saw operation. Checking time with operators to be sure they are in agreement.

Seeing that arrangmments are made for relief or replacement of crews when long shifts are evident.

Arranging for proper care, maintenance and service of saws.

Reporting to immediate superior upon completion of assigned job.

Note: Use only as needed.

JOB DESCRIPTION - TANKER BOSS

The Tanker Boss is responsible to the Fire Boss on fire below the sector stage; to the Sector Boss on all other fires for efficient use of tankers or pumpers. This job requires the services of a man who is not only familiar with fire behavior, but also skilled in the correct use of water and hose lays in direct attack on fires and conservative use of water in mop-up. He must also be familiar with the operation and maintenance requirements of various types of pumpers. Based on instructions from his immediate superior he will:

Assign tankers or pumpers to designated locations.

Supervise and correlate the work of the tankers and personnel assigned to his operation. Each tanker crew foreman should be given specific instructions as to just where and what his assignment is; e.g. hot spotting, working hot line, mop-up, cooling off around snags for fallers, assistance in back firing, etc.

Coordinates work of tanker and hand crews in same area, e.g. tanker crew will work hot line and cool off flames, with hand crew assisting in hose pulling and actual line construction behind tanker crews. Hand crew will turn, stir and scrape smoldering material for hose crews in mop-up work.

Inform immediate superior as to approximate location of tankers that can be called upon in emergencies for assistance on slop-overs, spot fires, etc.

Instruct tanker crew foreman to be on alert for spot fires and give immediate attention to them and stand ready to assist adjacent Crew Bosses who might call for help in emergencies.

Advise immediate superior of changes in location of tanker equipment.

Know principles of water use as outlined in pamphlet - "Water vs. Fire."

Work with tanker operator giving any necessary training in proper use of water and see that necessary training is given to the crew.

Give special emphasis in training in use of water to volunteer or pickup crews assigned to tankers and to crews on cooperator tankers.

Inform tanker crew foreman of tanker refill locations, or arrangements for refill by mother tankers.

Make arrangements and issue instructions for correlation of tanker crews for progressive hose lays, up hill water relays, etc.

If necessary, assist tanker crew foreman in developing an understanding between tanker operator and crew on hand signals to be used.

Check with immediate superior on arrangements for relief crews for tankers.

Check with tanker operators to be sure tankers are being properly serviced and whether being operated properly. Check especially when being operated by pickup, coop., or relief crews.

Check with immediate superior (and Service Chief or Equipment Officer) on arrangements for supply and delivery of fuel and lubricating oil.

Check on availability and use of proper equipment, fittings, nozzles, hose, etc., on tankers.

Inform his superior immediately of any tanker break-downs.

Inform immediate superior of progress being made on assignments and completion of assignments.

Provide for safety and welfare of equipment and personnel assigned to him.

Advise all tanker crew foreman of hazards of the job and have adequate plans of escape to be used in the event of a blow up.

Keep and submit time to timekeeper for all equipment and personnel under his supervision .

True safety is within our reach and needs only to be practiced to be realized.

Note: Not required on all fires.

JOB DESCRIPTION - SERVICE CHIEF

Works under the supervision of the Fire Boss.
Is responsible for furnishing all facilities and services called for in the plan of control for the fire. Such services and facilities to include timekeeping and commissary issues, Communication, Transportation, Supply and Camp Management in the proper amounts and at the proper time and place. This intends:

1. Personnel fed, rested and segregated by units for rapid dispatch.
2. Tools sharpened and segregated.
3. Transportation facilities serviced and manned by drivers.
4. Specialized equipment serviced and manned by operators.
5. Communication facilities installed, serviced and manned by operators.

Establishes, maintains and operates fire camps, assigning and supervising personnel needed to operate the camps. Will ordinarily secure information from plan of control on camp location, but in absence of such a plan, will independently plan the camp locations needed for proper service of line personnel. When independent plan is made, review by Fire Boss, Plans Chief or Line Boss will precede establishment of camps. Furnishes men, tools and specialized equipment as ordered. Anticipates requirements in general terms. When given a manpower and overhead list, will independently determine rations, bedding, commissary, and transportation requirements and obtain or have such items immediately available. Is responsible for keeping such supplies available and ready for use as called for.

Obtains, services, and operates a transportation fleet to transport men, supplies and equipment. The size and character of the fleet is ordinarily determined by the Service Chief from an analysis of the control plan and anticipation of transportation requirements based on:

1. Transportation routes
2. Facilities available
3. Type of objects to be transported

Decides mode of transportation, schedule of trips, routing, etc. Establishes, maintains and operates a communication system that will provide continuous service for:

1. The Plans agency and its field personnel.
2. The Line Boss and his Sector Bosses.
3. The Line Boss and the Fire Boss.
4. Service Chief and his outposts.
5. Fire headquarters and the behind the lines agency.
6. Special needs as determined by the Fire Boss and stated in the plan of control.

Will anticipate normal needs on the basis of the organization, personnel, and location of probable control line. Refinements will be based on approved control plans.
In addition to the stated requirements of manpower, tool, equipment and facilities, independently calculates the anticipated attritional losses of the particular fire and requisitions and distributes the items needed to maintain the quantity of control resources at the proper level.
Upon receipt of the planned line organization, organizes and dispatches crews and equipment in accordance with instructions. Is responsible for the line forces until delivered to the place and/or person called for in the instructions.

Specifically, he:

1. Determines the personnel and organization requirements of the service unit.
2. Determines time required for mobilization of resources (from determination of needs to available for dispatch from headquarters base or similar point - "Mobilization Time Lag.")
3. Determines time required for distribution of control resources from base to key points on line "Distribution Time Lag" and adjusts camp routine to absorb this time element.
4. Determines source, quantity and type of unobligated control resources available for assignment to the operation and keeps this information currently summarized.
5. Maintains contact with Assistant Service Chiefs and sees that they efficiently and completely serve line forces.
6. Determines through consultation with Dispatching Agency and the Fire Boss a priority of release for man-power and equipment. As surpluses become evident, organizes and dispatches to their destination.
7. Determines replacement needs of men, overhead, equipment and supplies and takes necessary steps to have available as needed.
8. For each basic item requested (50 men, 2 RD-7's, 5 saddle horses, etc.) determines and obtains the supplementary items necessary to make the item a sustained operating unit.
9. Supervises the work of Transportation Officer, Supply Officer, Communication Officer or Camp Officer. In their absence or prior to their arrival, must perform the duties of the position.
10. See that necessary departure from accepted safety practices in camp setups and transportation facilities are compensated for by improvisation and special cautioning of responsible personnel.
11. Sees that adequate first aid facilities are available in camps and on the line.
12. Registration of all incoming and outgoing personnel and specialized equipment.
13. Maintain time records of all personnel and special equipment.

JOB DESCRIPTION - EQUIPMENT OFFICER

The Equipment Officer is responsible to the Service Chief for determination of transportation needs, including a reasonable reserve, operation, and maintenance of transportation facilities. Specific duties are:

1. On the basis of items to be transported within specific time limits, determines the type and amount of equipment needed.

2. Determines the number of personnel, drivers, mechanics, packers, etc., needed for operation and maintenance of transportation facilities.

3. Determines the supplies (gasoline, oil, repair parts, forage, saddles) needed to maintain transportation facilities in safe and efficient operating condition.

4. Handles the service and maintenance of mechanized equipment such as bulldozers, power saws, tank trucks, etc., the same as for transportation facilities.

5. Selects and posts, where necessary, the best transportation route to key points on fire. (Will check scouting information to determine how much independent work is necessary.)

6. Establishes traffic controls to prevent congestion or accidents.

7. Prepares traffic schedules which permit most economical use of transportation equipment.

8. Places orders through Supply Chief.

9. Organizes and supervises subordinate personnel.

10. Maintains current summary of transportation equipment showing type and location.

11. Instructs drivers on special precautions necessary to safe transportation which are peculiar to the trip.

12. Arrange timekeeping for packers, truck drivers, mechanics, etc. and for all rental equipment and check classification to be sure rates are correct.

JOB DESCRIPTION - SUPPLY OFFICER

Is responsible to the Service Chief for obtaining and distributing all items called for in the plan for control of the fire and with the exception of those duties assigned to the Camp Boss, the Equipment Officer and the Communication Officer, of maintaining them in working condition.

Specific duties are:

1. Keeps current summary of the location of all items assigned to the fire.

2. Checks all orders for completeness; determines need for supplementary items.

3. Places all orders with supplying agency and/or procures locally in accordance with established procedures.

4. Establishes time limits and schedules for placing of orders for the various classes of items used and notifies persons responsible for originating orders.

5. Determines obtainability of items which may be needed in control of the fire.

6. Maintains tools and equipment and assembles by logical line unit for issue each shift. Establishes and maintains a system of accountability.

7. Determines commissary needs (tobacco, socks, etc.) procures and arranges for issuance by the timekeeper.

8. Determines the replacement rate for all items except communication and transportation, and after approval of Service Chief, secures such replacement.

9. Organizes and supervises subordinate personnel.

JOB DESCRIPTION - COMMUNICATION OFFICER

The Communication Officer is responsible to the Service Chief for establishing, maintaining and operating the communication facilities. On the basis of statement of communication needs:

1. Determines equipment (type and amount) required for the job.

2. Determines personnel needs - technicians, operators, messengers, and guides.

3. Determines repair and replacement needs (crystals, tubes, telephone line, batteries, etc.)

4. Installs, maintains, and operates, where required, communication facilities.

5. Prepares schedules to meet requirements of the control plan within the limit of available resources.

6. Maintains record (map and chart) of location of equipment.

7. Independently works out and suggests improvements to communication system.

8. Organizes and supervises subordinate personnel.

JOB DESCRIPTION - AIR OFFICER

Where more than one aircraft (helicopter or fixed wing) are in operation on the same fire or in the same area, a qualified Forest Service employee assigned to the fire shall be designated as Air Operations Officer.

1. Air Operations Officer shall be responsible to the Service Chief. His duties will include the following:

    a. Assisting in the planning of all air operations and missions.

    b. Coordinating, assigning and scheduling all flights and flight missions.

    c. Establishing priority of flights and missions.

    d. Briefing pilots and other air operations personnel, including fire and safety problems. This includes providing pilots with a map showing power, telephone lines, and other special hazards.

    e. Instructing personnel making flights and enforcing safety requirements.

    f. Maintaining a record of all missions.

2. When use of aircraft is a part of the current operation on a fire, warning should be sent all local airports advising that the fire area is a zone of hazard and that all private aircraft should either stay away from the area or clear their proposed flight plan with the fire headquarters.

JOB DESCRIPTION - CAMP BOSS

Is responsible to the Service Chief for the establishment and operation of a base of operation. Is furnished with the location, general requirement and time schedule of the particular base.

Specific duties are:

1. Plans the detailed layout and sets up the base.

2. Organizes and supervises subordinate personnel.

3. Specifically designates and makes assignment to sleeping areas. Sleeping areas to provide for proper segregation of personnel, quiet, and for day sleepers the maximum amount of shade.

4. Sees that men are provided with proper sanitary facilities within the limits of available resources.

5. Provides for a safe water supply.

6. Organizes and schedules the feeding of personnel to meet the requirements of the control plan.

7. Establishes an assembly area and provides warming fires, bulletin board and similar facilities as needed.

8. Establishes and operates a first aid station for treatment of minor injuries. Arranges for treatment of more serious cases by a regular physician preparing necessary forms, etc.

9. Prepares instructions for Crew Bosses governing their responsibilities, times schedules and camp routine while in camp. Issues to each Crew Boss and posts on bulletin board.

10. Determines supply and personnel requirements for the camp management unit.

11. Organizes and mobilizes personnel for assignment in accordance with the plans for the shift. Actual dispatch of crews will be done by Service Chief.

V

REMINDER LISTS

ADMINISTRATIVE

TACTICAL AND STRATEGIC

SERVICE

CODES AND SIGNALS

OVERHEAD BRIEFING OUTLINE

1. Orientation

   General picture of fire
      Maps (location of fire, topography, fuels)
      History (History of fire to date, including status of control)
      Situation (Fire behavior, weather, values at stake)
      Plan of action including alternate plans.

   Control action now in effect
      Status of present control
      Rates of line construction
      Problems of line holding in fuel types

   What needs to be done
      General plan to accomplish
      Local problems and use of specialized equipment
      Mop up required in different fuel types
      Sources of manpower and local customs of supervising crews.

2. Job Assignment

   Size of jobs
   Location of jobs
   Method of operation (strategy and general tactics)

3. Special safety features

   How safety is handled
   General safety precautions
   Specific dangers to watch for

4. Forces Assigned

   Overhead
   Manpower
   Equipment
   Communication equipment
   Reserves

5. Service Arrangements

   Transportation (foot, horse, car, plane)
   Communication facilities and schedules
   Supply arrangements, present and immediate future
   First Aid facilities
   Commissary and welfare

6. Questions Regarding Assignment

GOOD FIRE MANAGEMENT PRACTICES

FIRE BOSS

1. Conduct Board of Strategy meetings before 12:00 noon and 12 midnight each shift.

2. Brief key line overhead at least an hour before crews are scheduled to go on fire line.

3. Either the Fire Boss, Plans Chief or Line Boss should make one trip by aircraft around the fire just before the Board of Strategy meeting.

4. Board of Strategy meetings should be restricted to fewest possible number of persons. Suggest it consist of Fire Boss, Plans Chief, Service Chief and Line Boss.

GOOD FIRE MANAGEMENT PRACTICES

PLANS CHIEF

1. Prepare chart showing fire organization and post on bulletin board.

2. Prepare tool lists in advance of shift and furnish to service section as early as possible.

3. Utilize spike camps on isolated sections of fire line.

4. Put plans section men to bed during slack periods to provide adequate rest, including Plans Chief, himself.

5. Use fire time reports for all possible personnel in order to reduce confusion and large crowds around the timekeeper.

6. Have information ready for briefing sessions such as latest scout reports, maps, etc.

7. Use duplicator machine for maps, and job assignments.

8. Recognize time lag when ordering outside overhead and labor. Correlate the arrival of overhead and labor to avoid holding men in fire camp on standby.

9. Allow for feeding time of outside crews before placing on fire line.

10. Keep scouting data current at all times.

11. Request scouts to transmit latest information to plans section before Board of Strategy meeting.

12. Provide a local advisor for off-forest fire teams.

13. Provide guides for off-forest personnel where needed.

14. Request special fire weather forecast in advance of Board of Strategy meeting.

15. Order additional aerial photos in advance of needs and check with service and supply to be sure both sets (Ranger & Supervisor) of Forest photos are sent to fire.

16. Use mirrorscope and aerial photos showing outline of fire as an aid to briefing line overhead.

GOOD FIRE MANAGEMENT PRACTICES

SERVICE CHIEF:

1. Change camp overhead (end of shift) at 12 noon and 12 midnight.

2. Feed overhead at least 30 minutes in advance of crew bosses and crews.

3. Set up fire headquarters at least 200 yards from main fire camp.

4. Furnish cooks with a daily schedule of meal time and numbers of men to be fed, each meal.

5. Put up tools, water and lunches in advance of shift and load in separate pickup if possible.

6. Transportation man to service all equipment during slack periods so that trucks are not held up for gas and oil.

7. Put service personnel to bed during slack periods to keep men fresh.

8. Provide plenty of fresh fruit, fruit juices and milk with all camp meals.

9. Vary menu each day.

10. Use disposable paper plates, cups, knives, fork and spoons. Eliminate dish washing as far as possible.

11. Contract special messing jobs when possible such as meals and lunches furnished by caterers, meat cutting, daily bread and milk delivery to fire camp, etc.

12. Order food by number instead of item name. Use prepared grub list furnished for this purpose. (Refer to Fire Camp Grocery Order.)

13. First meal in fire camp should be one that can be prepared quickly. Suggest canned beef stew, ham and eggs, weiners and beans, etc. (See menus in camp boss folder & F.C. notebook.)

14. Inform cooks that such personnel as Fire Boss, Line Boss, Sector Bosses, Scouts, etc. who have irregular hours should be fed a decent meal outside the regular messing hours.

15. Provide iced juices and coffee at all times in fire camp. Both to be kep in container with a spigot and served in disposable paper cups.

16. Get men on fire line at daybreak.

17. Do not stop movement of men after eating. Keep them flowing from chow line to trucks without any prolonged stops in route.

18. When trucks are loaded do not hold up getting men out of camp.

19. Place night shift crews on the line at 5 PM in order to provide relief for day crews before dark.

20. All car, pickup and truck keys should be turned over to transportation Chief.

21. A tent should be provided for personal gear of all men. Tags should be furnished by Records Officer and each item labeled with owners name and forest. A man should be provided to watch this gear on large fires. This job can sometimes be combined with that of Supply Officer.

22. Use telephone when available. This helps to reduce over use and confusion on radios.

23. Keep fire camps small. Keep maximum size at 250 men per camp.

24. Use fire camp direction signs on roads to fire camp. Use fire camp unit signs in the camp.

25. Provide a bulletin board at assembly area in fire camp. Post such information as meal times, map of camp, map of fire, fire organization chart, correct name of fire, etc.

26. Provide a fire camp police force to prevent men standing around without assignments, men working when not needed, men wandering around and keeping others awake, etc. and to see to it that proper use is made of prescribed sleeping areas.

27. Follow procedure given in "Flow of Men" instructions and charts. (Pages 62a, 62b and 62c F. C. Notebook) and in Service Chief's Folder.

28. Enforce rules of camp conduct.

29. Have stock of emergency tractor lights on hand for rental cats.

30. Feed men on isolated sections of line with food delivered by helicopter and/or fixed wing aircraft. Sleep these men on fire line to avoid long walking distance to base camp.

31. Use hot-can food or vacuum vat delivery of hot food to men in isolated spike camps.

32. Provide commissary in the early stages of the fire.

33. Make sure no slip-up occurs on arranging for transportation from fire line back to camp.

34. Truck drivers should get adequate rest.

Form 135-R-5
(Rev. 1950)

PERFORMANCE RATING

Home Forest.....

Rating For.....

Position Filled.....

Name of Fire.....

Give concise appraisal of quality of employee's performance and recommendations as to future assignments or training.

Signed.....

Fire Title.....

Date.....

Using Forest.....

GPO-S.F.-F.S.O

AGRICULTURE—FOREST SERVICE—SAN FRANCISCO

SCOUT REMINDER LIST

1. Fire Facts

   Location
   Behavior (surface, crown, spotting, roll)
   Rate of Spread

2. Weather (at specified locations)

3. Topography

   General features and character (i.e., flat, ridge, bluffy, broken narrow canyons)
   Slope in percent
   Barriers (slides, bluffs)
   Culture (road, trail, firebreaks)
   Soil conditions (loose soil, rocky soil, boulders)

4. Fuel Type (refer to photos and type description. Fire Control Notebook)

   Type
   Density - 25%, 50%, 75%
   Special hazards (snag areas, building, slash areas)
   Accomplishments (construction line)

5. Miscellaneous data

   Water (camp, pumper use)
   Camp sites
   Dropping areas or helicopter spots
   Accessibility (route, rate of travel)

TIMEKEEPING

Select and train capable timekeepers for fire camps.

Set up adequate facilities for accurate timekeeping at the start of each fire.

Impress upon timekeepers that time represents money and it is their responsibility to protect the interests of the Government. Sweetening of time will not be tolerated.

Each forest has a supply of mimeographed "Instructions to Timekeepers in Fire Camps." A set of these instructions should be given to each timekeeper. They should be studied and fully complied with.

COMPENSATION FOR INJURY

Follow instructions in "Instructions to Timekeepers in Fire Camps." Each forest has a supply of these mimeographed instructions.

See that Form CA-10 poster "Federal Employees-What to Do in Case of Injury" is posted in each fire camp.

Advise all fire fighters who to report injuries to in fire camp. Form CA-1 is required for every injury-Get data for Form CA2 for use when needed.

Arrange for first aid for minor injuries and medical attention for injuries requiring examination or treatment by a doctor.

MEETING A FIRE SITUATION

P PROBLEM

a. Fire Facts (Inventory)
   1. Behavior of fire: (past, present, predicted)
      Time of day and year
   2. Weather: Wind (velocity, direction) times
      Humidity, Fuel Moisture.
   3. Topography: Features (ridge, saddle, river, etc.)
      Slope, Barriers, Culture (roads, trails, fire-breaks, etc.).
   4. Fuel: Type, Density, Continuity or Changes,
      Values, Control accomplishments.
b. Facilities for Fighting the Fire (Inventory)
   1. Manpower, overhead, equipment, tools
      (kind, quality, quantity).
   2. Production rate
   3. When available

A ANALYSIS OF SITUATION

Consider, correlate, and calculate elements applicable to the fire.

P PLAN

a. Line
   1. Strategy and broad tactics by individual sectors.
   2. Alternate plans of control and conditions requiring their use.
   3. Time action is to be completed-priority, sequence.
   4. Assignment of overhead-manpower, tools, special equipment by sectors.
   5. Reserve forces available.
b. Plans
   1. Information to be gathered and time required.
   2. Records to maintain.
   3. Assignment of personnel and facilities.
c. Service
   1. Services to be provided-quantity, location and time.
   2. Assignment of personnel and facilities.

E EXECUTION

a. Convert Plan Into Action
   1. Brief personnel.
   2. Dispatch personnel.
   3. Provide follow-up supervision.

R REVIEW AND REMEDY

a. Check-each step from inventory to execution.
b. Inspect Performance and Accomplishments.
c. Modify plan promptly to meet changed conditions, errors or omissions.

FACTORS TO CONSIDER IN
CALCULATION OF PROBABILITIES

1. Temperature .....
2. Humidity .....
3. Wind ..... to date and forecast
4. Fuel Moisture .....

5. Topography ..... slope in percent, approximate
general character
effect on wind movement
soil formation

6. Exposure as it affects ..... temperature
humidity
fuel moisture
convection currents

7. Fuel Type ..... in which fire has burned
in which fire is burning
ahead of fire

8. Barriers ..... natural - artificial

9. History of Fire ..... from origin to date
knowledge of how past fires behaved
in the same or similar areas

FACTORS TO CONSIDER IN APPRAISAL OF CONTROL FORCE REQUIREMENTS

A. FOR MANPOWER-LINE WORKERS

1. Fuel (type and density)
2. Steepness of slope.
3. Type of line to be built-direct attack-trenching-backfire.
4. Type of labor available.
5. Optimum and maximum size of crew that can work in one direction.
6. Fatigue factor, length of time at work, in travel and method of travel-number of shifts previously worked.
7. Soil type in which working.
8. Night or day work.
9. Temperature.
10. Construction, betterment, holding done by same crew or as three separate operations.
11. Calibre of supervision-frequency of contact and quality of leadership.
12. Condition and appropriateness of tools.
13. Time required to distribute to location of work assignment.

B. FOR BULLDOZERS

1. Type of fuel.
2. Slope-steepness-favorable-unfavorable.
3. Soil formation.
4. Direct or indirect attack.
5. Size of machine.
6. Number of machine operators.
7. Supplied with line locators.
8. Working singly or in tandem.
9. Night or day work.
10. Amount of supplemental work to be done.
11. Skill of operator.
12. Possibility of breakdown.
13. Time to distribute to location of work assignment.
14. Number of men required to support-swampers, etc.

PRIORITY OF CONTROL ACTION

1. Factors which must be considered in deciding priority of control action.

   (a) Relative value of cover and/or resultant damage.

   (b) Cut off fire from most dangerous fuels-fast burning or high resistance to control.

   (c) Confine to one side of drainage or keep within a drainage if possible.

   (d) Keep fire to smallest area consistent with cost of control and value at stake.

   (e) Make all work contribute to final control of fire by
      (1) becoming a portion of final control line or
      (2) by delaying spread of fire until resources available to construct line at logical location.

   (f) Consider direct attack with machine power where too hot for manpower.

   (g) Last but not least - see that men are not placed in location which does not provide a "safe line of retreat."

PRINCIPLES OF BACKFIRING

1. All control lines except those right at the fire edge must be fired out to be efficient.

2. Favorable conditions for backfiring must be watched for, recognized and prompt action taken.

3. Recognize that backfiring is justifiable under adverse condition. Little to lose, much to gain. Use as delaying action.

4. Backfiring must be done when necessary and provide for an adequate job by:

   a. Proper location and construction of lines.

   b. Timing operations correctly:

      To take advantage of current and predicted weather.
      Proper sequence to tie in with other sectors.
      Proper speed to meet at designated locations.
      Proper speed to get width of burn necessary to hold.
      To complete the job within time limits allowed.

   c. Take advantage of drafts created by main fire and by slope and topography.

   d. Start backfire on higher portion of line so that the operation will proceed downhill.

   e. Avoid sharp angles in line. If unavoidable, use echelon firing.

   f. In unfavorable weather use auxiliary strip firing.

   g. Stop firing when backfire won't take.

   h. Use specialized equipment.

   i. Assure safety for men.

PRINCIPLES OF LINE LOCATION

Locate line, after consideration of the following:

1. To have line adequate distance from fire so that line can be completed and held with probable rate of spread and fire behavior.

2. To allow adequate time to permit available forces not only to build lines but also do needed supplemental work, such as snag falling and backfiring, in advance of bad burning conditions.

3. As close to fire edge as conditions permit.

4. To make line as short as possible.

5. To use easiest routes for control without sacrificing
   (a) Holding practicability.
   (b) Too much area.
   (c) Values.

6. To eliminate all possible hazards from fire area and to provide adequate safe distance between lines and hazards that must be left in the fire area.

7. To avoid undercut lines and sharp angles.

8. To utilize barriers where practicable.

9. To take advantage of the possibility of use of machinery for construction of fire line.

10. To provide for safety of men.

SAFETY IN FIREFIGHTING

Full recognition must be given to the hazardous nature of fire suppression work. Safety rules covering this activity are to be followed. Situations will continue to arise where facilities for doing the job according to orthodox safety rules are not available. In such cases, individuals must improvise or instruct sufficiently to get the job done and done without undue risk to individuals or to property.

Things to keep in mind on every fire are:

1. General instructions should include a discussion of hazards and applicable safety measures. This should be done at each administrative level.

2. Take a few minutes at the beginning of each shift to train men in the proper use of tools. It will pay off in increased production as well as to reduce injuries.

3. Secure prompt treatment for injured employees regardless of how minor the injury may be. Foreman should carry pocket first-aid kits on the line.

4. Select escape routes and plan the escape well in advance of actual needs.

5. Remember that hazards exist in camp, on the way to the line and on the job. Be sure you are prepared for all situations.

SUGGESTED BRIEFING IN SAFETY FOR FIREFIGHTERS

INTRODUCTION FOR CREW LEADERS OR OTHER BRIEFING OFFICERS:

The following is a suggested safety talk to be given to crews of firefighters. Whether you use this outline or one of your own, do not fail to give each crew of firefighters a briefing on safety BEFORE they leave camp for the fire line.

First: Is any firefighter too old, or otherwise physically unable to go on the fire line? Any without adequate footwear? Misfits should remain in camp (once in awhile one slips through the screening process at the place of hire).

Second: Gather your men in a tight, compact group. Say what you say with emphasis and loud enough so you can be heard. Speak slowly, carefully, and distinctly one item at a time. You can't sell Safety with mumbles, lack of sincerity or if you talk too fast.
Read your briefing if you wish to do so.

Third: Carry on with Safety Supervision and Instruction on the fire line.

Here are a few pointers on how to keep yourself out of trouble while you are on this fire:

1. Your leader is an experienced man. Stay with him and do what he tells you to do.

2. Now here is the way to carry firefighting tools safely. Down at your side like this (demonstrate). Never on your shoulder - that's dangerous (demonstrate).

3. When you walk to the fire line, and when you walk back, keep at least six feet apart - like this (demonstrate) - in single file.

4. When you are working with tools, don't get too close to the other fellow. He doesn't want a McLeod in his back. Work at least ten feet apart (demonstrate). And let me tell you we don't want any wild swinging of tools, especially axes. Keep yourself and tools under control.

5. Your feet are your worst hazard. Watch where and how you put your feet down. Get good footing at all times - then you won't fall, slip, or end up with a sprained ankle.

6. Don't wander away from your crew. Men have been burned to death by sneaking off for a snooze. If you tire out, tell your leader and he will let you rest a spell in a safe place.

7. Don't let a branch of a tree or of brush smack you in the face or poke your eye, or smack someone else by letting 'em fly back.

8. Keep away from beneath old dead trees, especially if they are burning - limbs or the top may fall.

9. Be on the alert for rolling rocks (explain) or rolling logs (explain), when walking or working on slopes.

10. Don't step in burned out stump holes - they'll be full of hot coals.

11. When hot and thirsty drink water slowly, and not too much at one time.

12. When traveling in a truck equipped with seats, sit down and stay seated.
    When traveling in a truck without seats, sit down on the bed of the truck. Don't sit with legs hanging over side or end of truck bed.
    If you cut yourself or blister your heels or hands, or receive any other injury, report it to your leader immediately, and receive first aid.

    SAFETY is all a matter of common horse sense. Use common sense and you'll keep yourself and others out of trouble and get the job done SAFELY!

SUNRISE AND SUNSET TIME TABLES

		Southern California (Angeles, Cleveland, Los Padres, San Bernardino Forests)		Central California (Sequoia, Sierra, Stanislaus, Eldorado, Tahoe & Inyo Forests)		Northern Californi (Shasta-Trinity, Klamath, Mendocino Trinity, Six River Lassen, Plumas & Modoc Forests)	
		Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset
Pacific Standard Time	Jan. 5	0700	1657	0715	1656	0735	1656
	25	0656	1715	0709	1716	0728	1717
	Feb. 5	0648	1726	0700	1729	0717	1732
	25	0628	1745	0637	1750	0652	1755
	March 5	0618	1752	0626	1758	0640	1806
	25	0551	1808	0556	1817	0606	1827
	April 5	0535	1817	0540	1826	0548	1838
	25	0510	1832	0512	1845	0517	1900
Pacific Daylight Saving Time	May 5	0559	1941	0601	1953	0603	2011
	25	0544	1955	0544	2010	0544	2030
	June 5	0541	2002	0539	2018	0539	2038
	25	0542	2008	0539	2026	0539	2046
	July 5	0547	2008	0544	2025	0544	2045
	25	0559	1959	0558	2014	0559	2033
	Aug. 5	0607	1951	0607	2005	0609	2023
	25	0621	1929	0625	1938	0629	1959
	Sept. 5	0629	1919	0634	1923	0641	1936
	25	0643	1847	0652	1851	0659	1904
Pacific Standard Time	Oct. 5	0550	1733	0559	1737	0609	1747
	25	0606	1708	0619	1709	0631	1717
	Nov. 5	0616	1657	0629	1657	0644	1702
	25	0635	1645	0651	1643	0709	1645
	Dec. 5	0645	1643	0659	1642	0719	1642
	25	0657	1649	0713	1647	0733	1647

The times shown will generally be correct within a few minutes in most parts of each zone, but will vary some, due to longitude, latitude and topograph (high mountains). Daylight will precede sunrise and darkness will follow sunset by one half-hour to an hour of the sunrise and sunset times shown.

MESSING GUIDES

1. First order of supplies to be sent out from Ranger or Forest Headquarters, following a planned list for the number of meals to be provided.
2. Future orders to be prepared by one person-preferably one with experience as steward-after an inventory has been taken of supplies on hand. This order to be screened by Supply Officer. If planned list is followed, deduction should be made for supplies on hand. Supply Officer should have Camp Boss and messing experience to meet qualifications to do the job.
3. Advance arrangements to be made for purchase of staple supplies to permit of return after each fire of undamaged, unopened goods.
4. Emphasis to be placed on furnishing plentiful, wholesome, well-prepared foods, rather than on variety. Canned fruit to be served, preferably top grade, with plenty of fruit syrup. Emphasis to be placed on use of oven in fire camps. Beef and ham roasts may be served with gravy in camp, and makes excellent sandwiches. Ham may be served fried in camp or for sandwiches. Because of less waste, ham should replace bacon. The hocks may be used as seasoning in dry or canned beans, or may be cooked in pressure cooker and utilized for sandwiches. Hamburger also has utility for camp, fried or in meat loaf, or for sandwiches-large meat grinders and 16 quart pressure cookers with each large mess outfit are desirable. Meat cutting in camp should be only a last resort measure.
5. Fresh fruits should be confined to types that carry and keep well, and that can be utilized in lunches-such as oranges and apples. Watermelons require special cooling, are awkward to handle, the waste is large and the disposal problem increased. Canteloupe if placed in large garbage cans with chopped ice are excellent for morning or evening meals. Peaches-pears-and grapes in season are good when truck transportation is available.
6. Fresh vegetables should include potatoes, tomatoes, onion, celery, carrots, lettuce and a small amount of garlic. These serve a dual purpose for stews and salads. Vegetables should be cleaned and iced well in advance of planned uses, in salads or to cook; protection from sun and dust is a must.
7. Eggs should be purchased in medium size, and careful check made, before each order of stock on hand and expected manpower. Three eggs per man per day should be figured.
8. Canned vegetables should be restricted to standard items of peas, string beans, tomatoes and corn. Tomato sauce serves admirably as seasoning for stews and meat loafs. Canned new potatoes, if obtainable in gallon sizes, are economical in that there is no waste, and no preparation necessary. They can be served hot, as is; in stew, fried, or used in salads-Loss in case of left-over cans is nil, which is not the case with fresh potatoes.
9. Margarine should largely or completely replace butter.
10. Corn beef hash in gallon cans is an excellent commodity for the first meal in camp. It can be enlivened by the addition of fresh onions, and either fried or warmed in the oven. A serving of hash, topped by a fried egg, makes an excellent breakfast substitute for ham.

11. If the need for mess continues beyond the first day, stew should be on the stove at all times. It should contain plenty meat, with potatoes, onions and carrots replenished often. Vegetables should not be placed in original stew until meat is fairly well cooked.
12. Sandwiches should contain palatable, tender meat, lettuce and oleo. One jam or jelly sandwich should be supplied in each lunch. Prepared pork loaf or other canned highly-seasoned meat preparations should be avoided as much as possible.
13. Cold juices should always be on tap in camp, preferably unsweetened varieties such as grape-fruit and orange.
14. Kitchen should be roped off well, and none but kitchen help permitted. Feeding area should likewise be roped off, with tables for sugar, milk and condiments, to prevent loss of eating equipment and concentrating debris in one location. Dishwashing is very important. Use plenty of hot water and detergent soap. Change wash water and scalding water often-check dishes for grease.
15. Garbage disposal and facilities should be given high priority.
16. Sauerkraut, spinach, asparagus tips, etc., should be avoided for fire camp use. Rice can be subsituted for spuds after early meals and can be served in puddings with raisins. Surplus bread may also be used in this manner.
17. Camp Boss should be experienced in messing large numbers of men, or should be furnished with a high type of cooks and helpers.

SUGGESTED MENU FOR 100 MEN
FOR FIRST DAY OF FIRE

Supper	Breakfast
Hamburger	Scrambled eggs
Potatoes	Ham
String beans w/bacon	Canned fruit
Lettuce & Tomato Salad	Fruit juice
Coffee - Milk	Bread, butter, jam
Bread, oleo, jam, sugar	Coffee - milk
Canned fruit - fruit juice	

SUPPLIES NEEDED FOR ABOVE MENU FOR 100 MEN

	Approx. Weight (pounds)		Approx. Weight (pounds)
Hamburger	60	Apples, 1 box	50
Potatoes (reduce by 25% if canned)	60	Milk, fresh, 120 half pints (30qt)	80
String beans, #10 cans, 5	35	Milk canned, 8 tall cans	8
Bacon (seasoning - beans)	3	Fruit juice, (46 oz cans) 2 cases	80
Bread, 20-1½# loaves or 30-1#	30	Coffee	10
Oleomargarine	10	Vinegar, 1 qt.	2
Jam (2# jars), assorted, 5	10	Salad dressing 2 qt.	5
Eggs, 20 dozen	40	Sugar (5 lb. bags) 2	10
Hams, 3	45	Pepper (2 oz. cans) 4	
Fruit, canned (#10 cans) 10	70	Salt (1 lb packages) 3	3
Tomatoes, 2 lugs	60	Cooking oil 2 qt.	2
Lettuce, 15 heads	10	Catsup 6 bottles	3
Oranges, 1 box	65	Matches 2 boxes	
		Ice (if necessary)	(300)
		(1051)	751

LUNCHES

Lunches are generally purchased already made up, but if it is necessary to make them up at the fire camp the following menu can be used:

Lunch
1 jam sandwich*
2 meat sandwiches*
1 orange, 1 apple
Cookies

*(wrapped in waxed paper)

Supplies needed for 100 men	(pounds)
Bread, 25-1½# loaves or 40-1# loaves	60
Lunch meat, 200 slices	25
Oleomargarine, 10 lbs.	10
Jam, (3# jars) assorted 5	10
Cookies	20
Lettuce, 10 heads	10
Oranges, 1 box	65
Apples, 1 box	50
Bags, paper (#8) 100	2
Paper, waxed 300	2
	254

CHECK LIST FOR FLOW OF MEN IN CAMP

A. Men entering camp initially

1. Men arrive by car or truck and enter vehicle parking area.

2. Truck master instructs men to report to timekeeper.

3. Timekeeper instructs men to go to assembly area.

4. Men go from assembly area to latrines, wash area and return.

5. Men go from assembly area to kitchen and eating area for meals and return to assembly area.

6. Men go from assembly area to sleeping areas.

CHECK LIST OF FLOW OF MEN IN CAMP

B. Flow of men leaving camp

1. Men leave sleeping areas for latrines and wash area.

2. Men leave sleeping or wash areas for assembly area.

3. Men leave assembly area for kitchen and eating area and return.

4. Men leave assembly area for timekeeper, crew boss leaves "Crew Fire Time Report 75-R-5" with timekeeper and all go to vehicle parking area and are checked on trucks.

5. Trucks and tool vehicles leave camp for line.

C. Flow of men returning to camp.

1. Trucks enter vehicle parking area.

2. Men leave truck, crew boss leave "Crew Fire Time Report 75-R-5" with timekeeper and group go to assembly area.

3. Men go to latrine-wash area from assembly area and return.

4. Men go from assembly area to kitchen-eating area for meals and return.

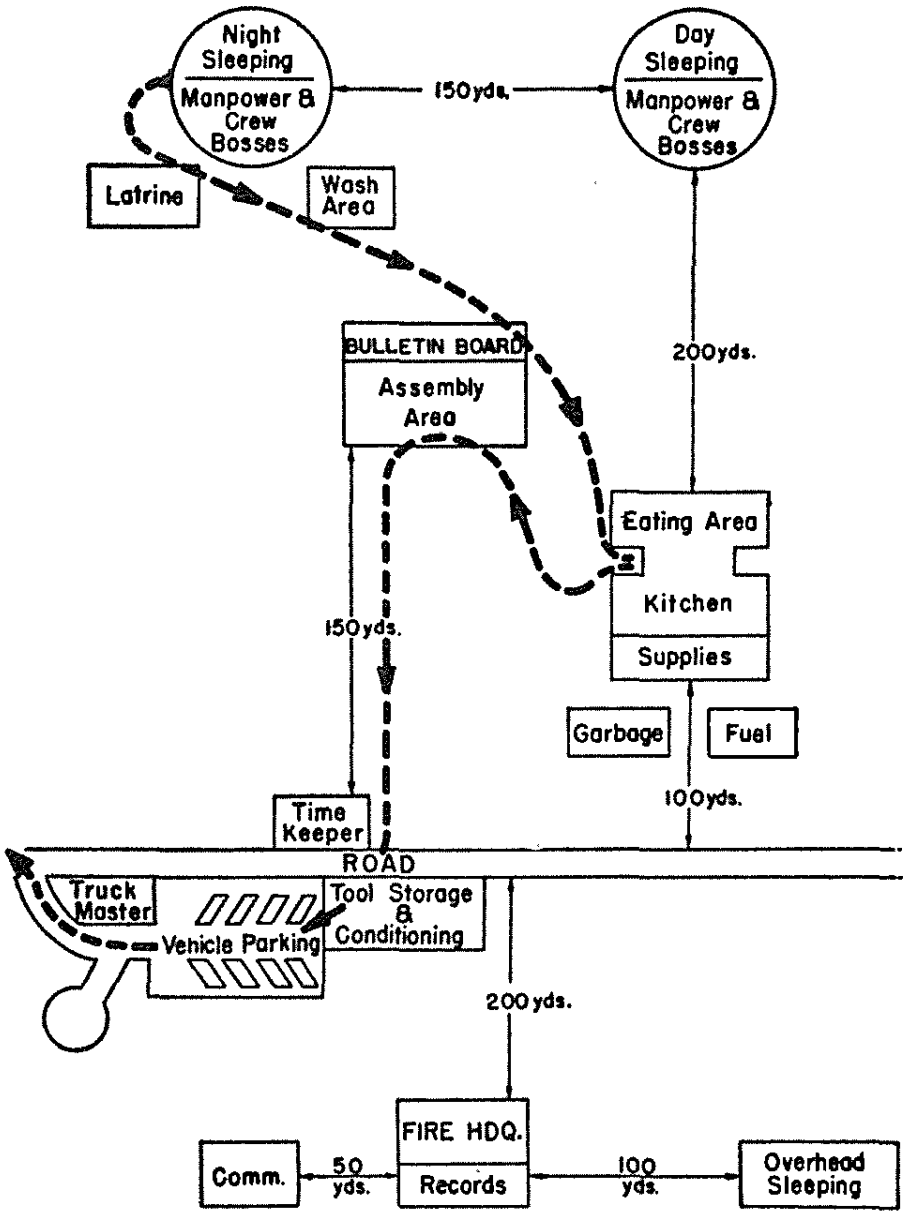
5. Men go to sleeping area.

FLOW OF MEN GOING

ON SHIFT

AND

SAMPLE FIRE CAMP LAYOUT

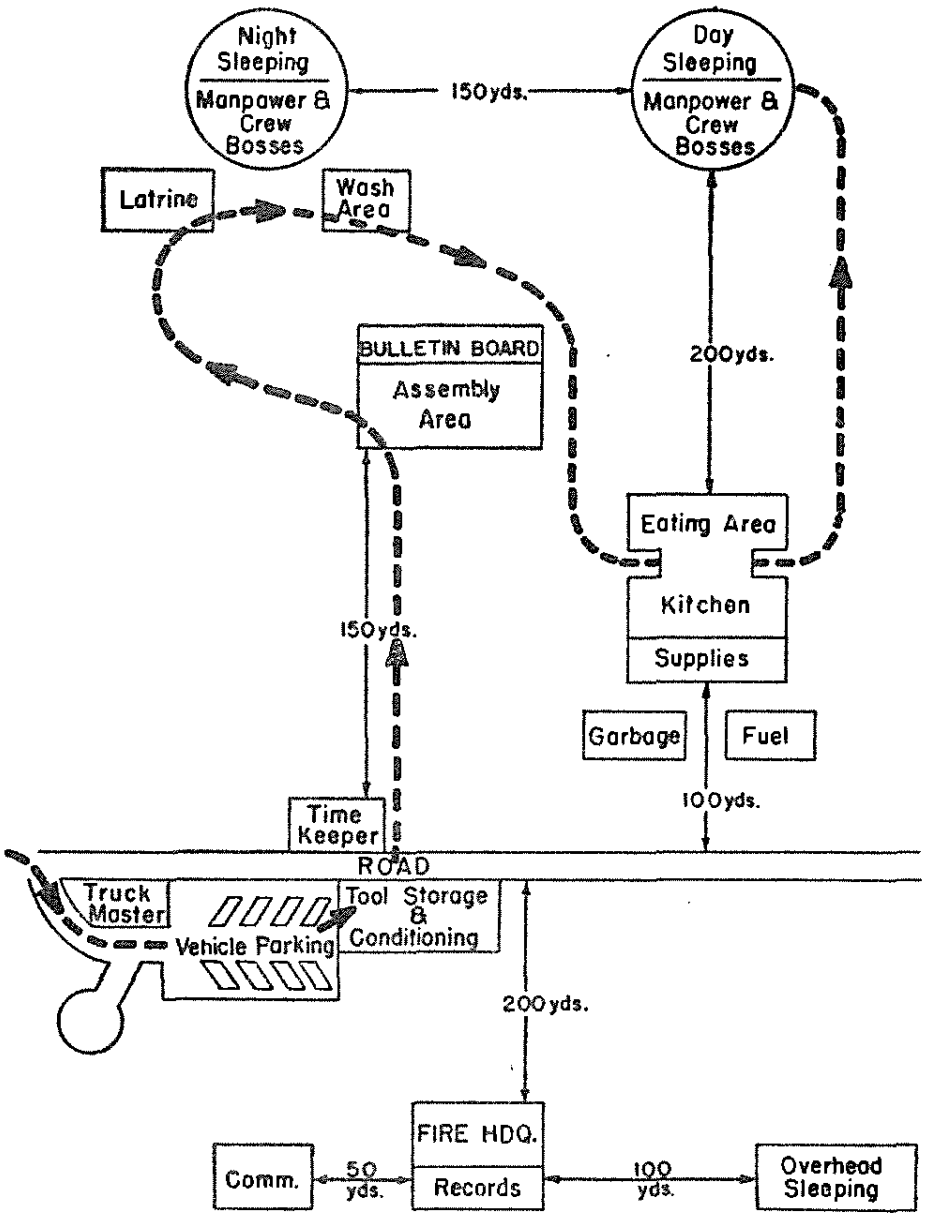


FLOW OF MEN GOING

OFF SHIFT

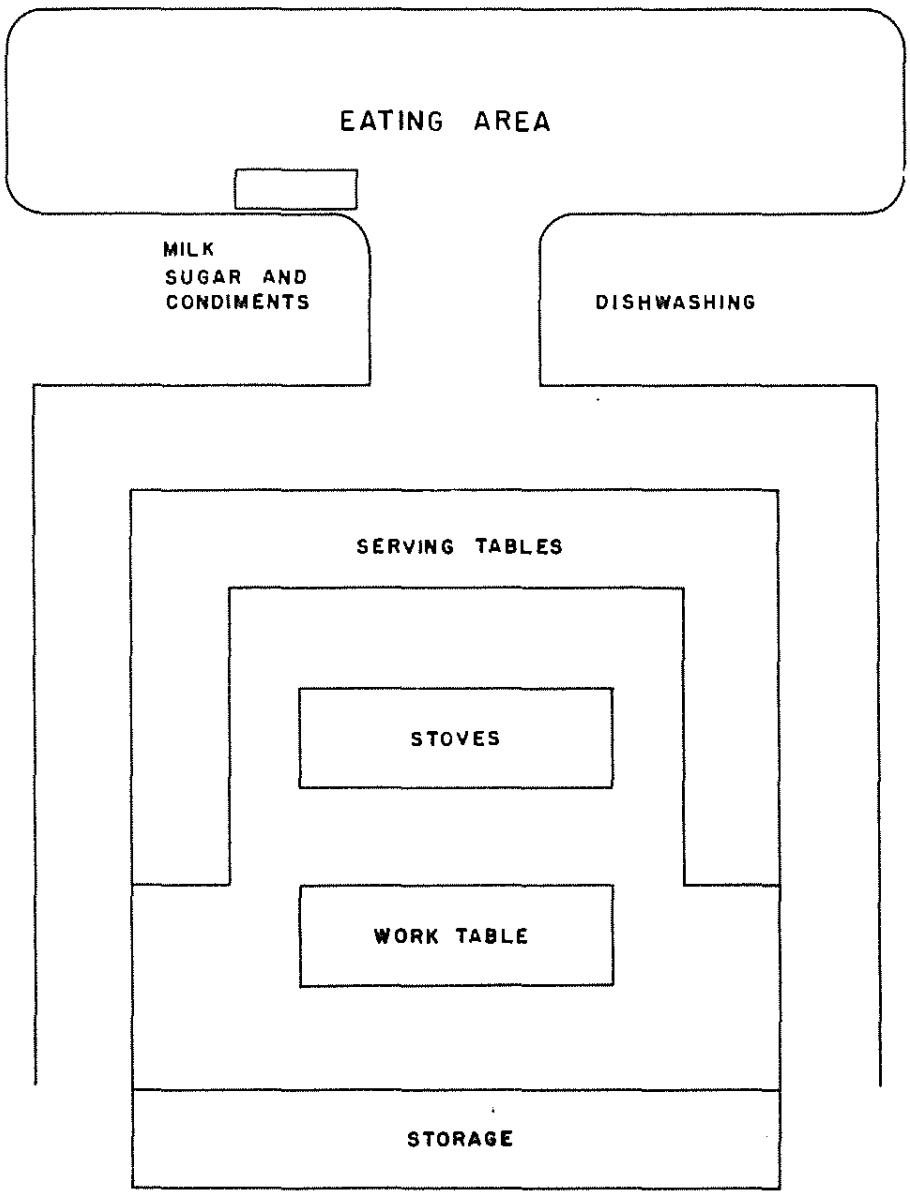
AND

SAMPLE FIRE CAMP LAYOUT



SAMPLE LAYOUT

KITCHEN AND EATING AREA



STANDARD TOOL LIST FOR FIRE LINE WORK
BASED ON 70% CUTTING AND 70% SCRAPING

	25 Man Unit		50 Man Unit		100 Man Unit	
	Shift	3 days	Shift	3 days	Shift	3 days
Cutting Tools						
Axes, D.B.	8	18	15	34	30	69
Hooks, Brush	5	11	10	23	20	46
Pulaskis	5	11	10	23	20	46
Scraping Tools						
Shovels	8	18	15	34	30	69
McLeods	10	23	20	46	40	92
Backfiring Equipment						
Orchard Torches	1	2	1	2	2	4
Fusees, dozen	2	4	4	8	8	16
Miscellaneous Equipment						
Backpack Pumps	2	4	5	10	10	20
Canteens, 1 gal.....	25	50	50	100	100	200
Special Equip.(Order if needed)						
Pruning Shears						
Falling Equipment						
Saw, falling (w/g).....						
Wedges, wood						
Cans, oil, 1 qt.....						
Knapsacks						
Hammers, 8#						
Hammers, saw						

GASOLINE AND OIL REQUIREMENTS GUIDE

Gallons of gas and oil required:

Type Vehicle (Loaded)	* Per 100 Miles							
	State Highway		County Roads		Truck Trails		Fire Lines, etc.	
	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil
Sedan	5.5	.5 pt.	6	.5 pt.	6.5	.6 pt.	10.0	.6 pt.
Pickup	6.0	.5 "	6	.5 "	10.0	.6 "	12.5	.6 "
4x4 Dodge	10.0	.6 "	10	.6 "	12.0	.7 "	14.0	.7 "
4x4 M. Herr.....	12.5	.6 "	14	.6 "	20.0	.7 "	25.0	.7 "
Transport (Gas)..	16.5	.6 "	20	.6 "	25.0	.7 "	33.0	.7 "
S. Side, Reg.....	10.0	.6 "	12½	.6 "	16.5	.7 "	20.0	.7 "

Gallons of diesel fuel and oil required

Type Vehicle (Loaded)	* Per 100 Miles							
	Fuel	Oil	Fuel	Oil	Fuel	Oil	Fuel	Oil
Transport 10T....	14.0	1.7 pt.	17.0	1.7 pt.	20	1 qt.	-	-
Transport 15-20T.	17.0	1.7 pt.	20.0	1.7 pt.	25	1 qt.	-	-

Type Tractor	*Per Hour of Operation							
	Walking Ave. Cond.		Heavy Cover		Medium Cover		Light Cover	
	Fuel	Oil	Fuel	Oil	Fuel	Oil	Fuel	Oil
D-4, TD-9	1.5	.9 pt.	2.3	1.4 pt.	2.0	1.2pt.	1.6	1.1 pt.
D-6, TD-14	2.0	1.0 "	3.7	1.5 "	3.1	1.3"	2.5	1.1 "
D-7, TD-18	3.0	1.1 "	4.6	1.6 "	3.9	1.4"	3.1	1.2 "
D-8, HD-14 TD-24.	4.0	1.2 "	7.2	1.7 "	6.0	1.5"	4.8	1.3 "

Helicopter - Gasoline and Oil Requirements

Type	Requirements per hour of operation
Bell and Hiller	15 gallons of 91 octane aviation gasoline 1 quart of aviation 1100 oil

*Note: It is necessary for the Service Organization to estimate the number of miles or hours of operation per shift different types of vehicles will operate on the fire to determine the amount of fuel and lubricants to order and have on hand.

ENGINE OIL REQUIREMENTS

The figures shown are for average consumption, plus oil drain.
Oil drain period for vehicles is 3,000 miles.
Oil drain period for tractors is 80 hours.
The crankcase capacities for cars, pickups and 1½ ton trucks averages 6 qts., for transports 20 qts., and for tractors 17-30 qts.

GEAR OIL REQUIREMENTS

Drain period for most tractor gear cases is 480 hours.

Drain period for vehicles is 9,000 miles.

Replenishment of gear oil because of loss through leaks or repairs would constitute the only requirement for this type lubricant.

Gear oil is supplied in drums of the following capacities:

400 lbs.
100 lbs.
35 lbs.
10 lbs.
5 lbs.
1 lb.

Drums such as 35# size are desirable to permit ready distribution if necessary.

CHASSIS AND TRACK ROLL LUBRICANTS

Lube intervals for vehicles is 500 miles.

The average chassis lubricant required per service is ½ lb.

Lube intervals for tractors is based on progressive procedures. Some parts require daily lubrication; other parts every 40 hours, etc.

The average Track Roll Lubricant required to service a tractor daily averages 2 to 4 lbs., depending upon condition of the unit.

These lubricants are supplied in the same size containers as for gear oil and smaller sizes are desirable.

OTHER LUBRICANTS

Water Pump Lubricant and Wheel Bearing Lubricant are desirable. Consumption is limited in both instances and quantities can be held to a minimum.

PACK STOCK TRAVEL TIME

AND

FORAGE REQUIREMENTS GUIDE

	Private Stock	Government Stock
Average pack per animal in pounds	150	175
Forage needs per animal day in pounds		
Grain	6	6
Hay	20	20
Travel rates in miles per hour for pack string on standards of trail shown:		
Upgrade		
Good	2.5	2.5
Medium	2.0	2.0
Poor	1.5	1.5
Downgrade		
Good	3.0	3.0
Medium	2.8	2.8
Poor	2.0	2.0
Up and Downgrade		
Good	2.8	2.8
Medium	2.5	2.5
Poor	1.8	1.8

NOTE: These are reasonable rates to expect with average loads for long trips. For short trips both rate per hour and weight of pack could be increased 30%.

Hay and grain estimate is for working stock.
The hay to be of good quality.

FIRE MAP LEGEND

ROADS – GOOD	(BLACK)
ROADS – POOR	(BLACK)
TRAILS	(BLACK)
RAILROAD	(BLACK)
TELEPHONE LINE	(BLACK)
RIDGE	(BLACK)
DRAW	(BLACK)
STREAM	(BLACK)
BUILDINGS	(BLACK)
FIRE BREAKS	(BLACK)
EDGE OF FIRE	(RED)
PLANNED LINE LOCATION	(RED)
CONTROLLED LINE	(BLACK)
TRAILBUILDER LINE	(BLACK)
SECONDARY LINE OF DEFENSE	(ORANGE)
SPOT FIRES	(ORANGE)
SECTOR POINTS	(1)(2) (BLACK)
DIVISION POINTS	[A][B] (BLACK)
FIRE CAMP	(C) (RED)
FIRE HEADQUARTERS	(RED)
COMMUNICATION STATIONS:	
TELEPHONE	[T] (BLACK)
RADIO	[R] (BLACK)
HELIPORT	Δ (RED)
WIND DIRECTION AND VELOCITY	---mph

NOTE: ARROW INDICATES DIRECTION OF THE WIND WITH MILES PER HOUR INDICATED ON STEM.

BURNS BY PERIODS

Sept. 10
11 a.m. – 4 p.m.

NOTE: USE DIFFERENT COLOR FOR EACH PERIOD. COLOR IN SOLID EXCEPT FOR PERIOD IDENTIFICATION BLOCK – USE A LIGHT TINT.

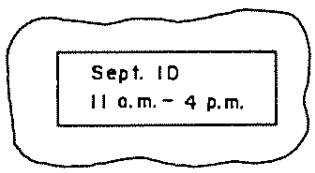
#78-R-5

FIRE MAP LEGEND

ROADS - GOOD		(BLACK)
ROADS - POOR		
TRAILS		
RAILROAD		
TELEPHONE LINE		
RIDGE		
DRAW		
STREAM		
BUILDINGS		
FIRE BREAKS		
EDGE OF FIRE		(RED)
PLANNED LINE LOCATION		
CONTROLLED LINE		(BLACK)
TRAILBUILDER LINE		
SECONDARY LINE OF DEFENSE		(ORANGE)
SPOT FIRES		
SECTOR POINTS	(1)(2)	(BLACK)
DIVISION POINTS	[A][B]	
FIRE CAMP	Ⓒ	(RED)
FIRE HEADQUARTERS	◪	
COMMUNICATION STATIONS:		
TELEPHONE	T	(BLACK)
RADIO	R	
HELIPORT	Δ	(RED)
WIND DIRECTION AND VELOCITY	---mph →	

NOTE: ARROW INDICATES DIRECTION OF THE WIND WITH MILES PER HOUR INDICATED ON STEM.

BURNS BY PERIODS



NOTE: USE DIFFERENT COLOR FOR EACH PERIOD. COLOR IN SOLID EXCEPT FOR PERIOD IDENTIFICATION BLOCK - USE A LIGHT TINT.

U. S. FOREST SERVICE--VISUAL SIGNALS--GROUND TO AIR

Jumper OK (Parachute and L). L
Personnel OK. LL
Change Jump Spot . . . . . J
Cargo Drop Target (form numeral
to identify targets when
several in same vicinity). . . . . T or T_2
Helicopter Landing Spot
(form numeral to identify
spot when several in same
vicinity). . . . . H or H_3
Need Cross-Cut Saw . . . . . S
Need Power Saw . . . . . SS
Need Climbers . . . . . O
Need Drinking Water. . . . . U
Need Food . . . . . F
Need Radio With Batteries . . . . . R
Need Batteries for Radio . . . . . RR
Need Hand Pump . . . . . P
Need Power Pumper Outfit . . . . . PP
Need More Help (form numerals
for 2 or more men). 2
Fire Manned Adequately . . . . . ≡
Able to Ride Horse . . . . . $\overline{2}$
Need Stretcher Crew. . . . . $\overline{3}$
Broken Leg. . . . . $\overline{4}$
Broken Arm. . . . . $\overline{5}$
Broken Back . . . . . $\overline{6}$
Head Injury . . . . . $\overline{+}$
Puncture Wound. . . . . $\overline{8}$
Unable to Diagnose. . . . . $\overline{9}$
Received Message - Wave Streamer

PLANE TO GROUND SIGNALS

"Received Message" - wave streamer or rock plane
"Will drop Message" - gun motor 3 times
"Fire Here" - plane circles 3 times

Signals should be 10 feet or longer. Do not change until pilot acknowledges signal by rocking plane. (Remove signal after emergency is over)

GENERAL INSTRUCTIONS

Ground party can best attract searching aircraft by use of devices such as mirrors, smokes, or animated movements. Once located, the parties can use the codes and suggestions listed. If ground party has no marker, move around in the open so pilot can see you.

All Forest Service airplanes have a marking panel which can be dropped to ground men who attract the plane's attention but have no means of making ground symbols. The ground symbols can be made from panel material dropped from plane or other devices can be used to form the emergency code symbols, i.e.:

rolled paper, newspapers, fresh cut peeled poles, rocks, scraped grass cover, or other methods:

a. A man standing upright with hands clasped above head (champ) will be considered O.K.

b. If no other signals are given, a man stretched out on the ground will be assumed to have injuries too severe to permit unaided movement.

Provide as much color contrast as possible between material used for symbols and background against which symbols are exposed. Symbols should be at least 10 feet long or longer if possible.

GROUND TO AIR EMERGENCY CODE

Standard smokejumper signals may be used for any emergency.

Jumpers O. K. **L**	Change Jump Spot **P**	Need Saw **T**	Need Climbers **O**	MORE HELP Write number of Men Needed
More Food **F**	Need Water **U**	Need Radio **R**	Require Guide Service **X**	Drop Cargo Here **H**
Helicopter can Land Here **Δ**	Signals should be 10 feet or longer. Do not change until pilot acknowledges signal by rocking plane. (Remove signal after emergency is over)			

If radio does not work, these signals will designate injury:

Distress	_____
Able to ride horse	_____ 2
Stretcher crew needed	_____ 3
Broken Leg	_____ 4
Broken Arm	_____ 5
Broken Back	_____ 6
Head Injury	_____ 7
Puncture Wound	_____ 8
Unable to diagnose	_____ 9

PLANE TO GROUND SIGNALS

"Received Message" - wave streamer or rock plane
"Will drop message"- gun motor 3 times
"Fire Here" - plane circles 3 times

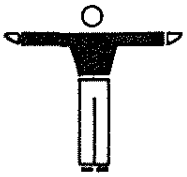
HELICOPTER USE SIGNALS

GROUND TO HELICOPTER SIGNALS

LAND HERE
(WAVE HANDS)

WIND BLOWING
THIS DIRECTION →
(OR THROW DUST
IN THE AIR)

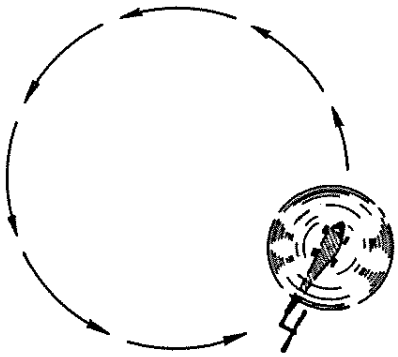
HELP



YES

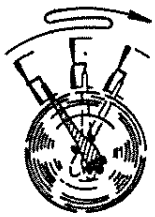
NO

HELICOPTER TO GROUND SIGNALS



WHAT IS WIND DIRECTION?
(CIRCLE)

YES
(PITCH) UP AND DOWN

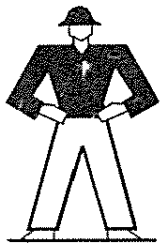


NO
(YAW) BACK AND FORTH

WATER USE HAND SIGNALS

HOW FULL IS TANK ?

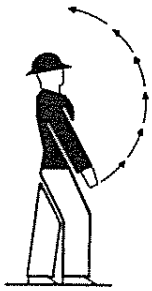
FULL



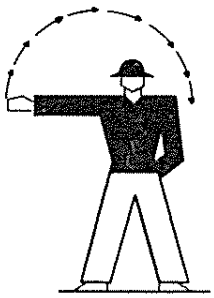
HALF FULL

LOW

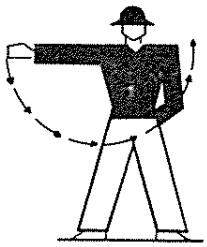
REPLY



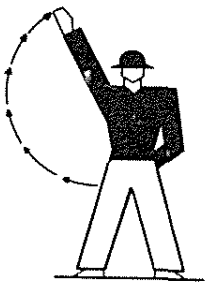
DELIVER WATER AT NOZZLE



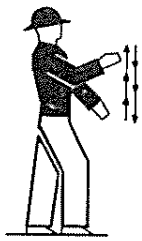
INCREASE PRESSURE



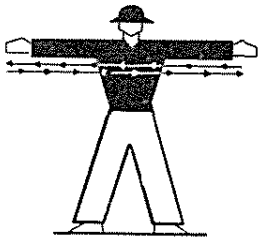
DECREASE PRESSURE



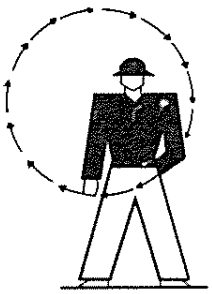
MORE HOSE



BROKEN HOSE



SHUT DOWN



ROLL UP HOSE

WORKING SHEETS

VI

10 A.M. FIRE REPORT

Name of Fire _____

Date _____

For all D and E Fires

These reports to be telephoned to Regional Office Dispatcher for conditions as of 0800 daily until fire controlled or as first report of dangerous fire potential. Include outside threatening fires.

1. Name of forest or agency responsible _____
2. Cause _____
3. Acres burned: F.S. Prot. Area _____ Area Prot. by Others _____
4. Location - origin or topographic location: Sec. _____ T _____ R _____
5. Fire fighting forces

		F. S. Responsibility			Other Agency
		No.	FF cost per day	Total Cost	
A.	All fire personnel (except free help)		38		
B.	Free Coop. help		15		
C.	Trailbuilders		265		
D.	Tankers		100		
E.	Portable pumps & special equipment		10		
F.	Power saws		36		
G.	Airplane hire on fire				
	(1) Small planes		125		
	(2) Large planes		600		
H.	Helicopters on fire		600		
I.	Transportation to & from fire	XXX			
	J. Total cost today				
	K. Previous total				
	L. Total FF cost to date				

6. Estimated total FF cost of fire _____
7. Timber burned: species, reprod. or mature _____
   MBM _____
8. What does fire threaten: _____
   towns, valuable timber stands, etc. _____
9. Damages: Timber $ _____ Watershed $ _____ Other $ _____
10. Progress being made in control of fire _____

11. Special information, i.e., lives lost, serious injuries, loss of improvements, weather conditions, etc. _____

Form 75-R-5
(Rev. 1954)

CREWFIRE TIME REPORT

Fire..... Forest.....

Date..... Reporting Officer..... Fire Title. .....

Name	Time Slip No.	Classi-fication	On Duty	Off Duty

INSTRUCTIONS FOR USE OF FIRE TIME REPORT

1. Prepare form in duplicate.

2. List first name, initial and last name, time slip number, classification, (whether laborer, straw boss, operator, etc.), and time on shift to the closest 1/2 hour for each man in your crew.

3. Present carbon copy to timekeeper before leaving camp for the line with your crew.

4. On return to camp, insert time off duty on original copy, for each man on the list, and present to timekeeper.

5. Prepare new lists in duplicate each day.

ON-THE-LINE SAFETY CHECK LIST

1. Men in good physical condition.

2. Men dressed safely; wearing hard hats.

3. Drinking water safe; salt tablets available.

4. Lunch and rest areas safe; lookouts posted.

5. Headlamps for night travel.

6. Alert for rolling rocks and logs; point out special hazards.

7. Planned line of retreat in case of blow-up, discussed and laid out.

8. Maintain safe distance while walking and working.

9. Avoid working in hot ashes.

10. Pass a burning or leaning tree above lean.

11. A clean cold burn is usually safest retreat.

12. Stay clear of dozer in operation.

13. Follow instructions of foreman.

AGRICULTURE—FOREST SERVICE—SAN FRANCISCO

Form 76-R5
(Rev. 1956)

FIRE TOOL REQUISITION

For* ..... Date..... Time.....

Location.....

No. Required	Item	No. Returned
.....	Axes.....	.....
.....	Brush hooks.....	.....
.....	Files w/handles.....	.....
.....	Pruning shears.....	.....
.....	Pulaskis.....	.....
.....	Saw.....	.....
.....	Saw handles, pair.....	.....
.....	Saw oil.....	.....
.....	Saw, power, No.....	.....
.....	Sledges.....	.....
.....	Wedges.....	.....
.....	McLeods.....	.....
.....	Shovels.....	.....
.....	Canteens.....	.....
.....	Knapsacks.....	.....
.....	Lunches.....	.....
.....	Backpack pumps.....	.....
.....	_____filled _____empty	.....
.....	Fusees.....	.....
.....	Orchard torches.....	.....
.....	Power flame thrower.....	.....
.....	First aid kits, pocket.....	.....
.....	Hard hats.....	.....
.....	Headlamps.....	.....
.....	Radio w/batteries.....	.....
.....	Type_____	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Ordered By.....

Filled By.....

Received By.....

* Sector 1; or Jones' Crew; or Elk Fire Camp

Instructions for Use of Fire Tool Requisition

1. Prepare form in duplicate.
2. Form will be filled out by Sector Boss and/or Records Officer after plans and assignments have been made for the next shift.
3. Give one copy of form to Service Chief at once.
4. Tool tender will enter number tools returned on his copy and file.

AGRICULTURE - ALAMEDA, CALIF.

Form 79-R-5
(Rev. 1949)

FIRE CALCULATION SHEET

for

Manpower, Overhead, Equipment, Supplies*

Fire..... Date..... Shift.....

Item Needed					

*Fill in headings as needed.

AGRICULTURE - ALAMEDA, CALIF.

MAP SHEET

Scale.....

Form 82-R-5
(Rev. 1949)

FIRE ASSIGNMENT SHEET*

Name of Fire.....Date.....Shift.....

Fire Boss.....Plans Chief.....

Line Boss.....Service Chief.....

Sector 1 Boss.....Assignment: Sector No.....

.....

.....

.....

.....

Map Sheet Scale.....(Indicate North)

*Replaces Form 82-R-5

AGRICULTURE-ALAMEDA, CALIF.

Forces Assigned

Sector Specialists	Crew Bosses	Man-power	Special Equipment or crews

Service Arrangements (Transportation - Communication - Supply - 1st Aid)

Supplemental Notes.

Form 136-R-5
(1949)

(OAKLAND—4-12-49—120,000)

MESSAGE and EMERGENCY INSTRUCTION SHEET

To..... From..... .....
Time

Place..... Place..... .....
Date

(Note: Where pertinent include map - specific instructions - forces assigned and service management in your message.)